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AIR QUALITY AND CHILDREN'S HEALTH

JOINT HEARING

BEFORE THE

SUBCOMMITTEE ON CLEAN AIR
AND NUCLEAR SAFETY

AND THE

SUBCOMMITTEE ON CHILDREN'S HEALTH AND
ENVIRONMENTAL RESPONSIBILITY

OF THE

COMMITTEE ON
ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE

ONE HUNDRED TWELFTH CONGRESS

FIRST SESSION

JUNE 8, 2011

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ONE HUNDRED TWELFTH CONGRESS
FIRST SESSION

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C O N T E N T S

AIR QUALITY AND CHILDREN'S HEALTH

WEDNESDAY, JUNE 8, 2011

U.S. SENATE,
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,
SUBCOMMITTEE ON CLEAN AIR AND NUCLEAR SAFETY,
SUBCOMMITTEE ON CHILDREN'S HEALTH AND ENVIRONMENTAL RESPONSIBILITY,
Washington, DC.

The committees met, pursuant to notice, at 10 a.m. in room 406, Dirksen Senate Office Building, Hon. Thomas Carper (chairman) presiding.

Present: Senators Carper, Inhofe, Lautenberg, Cardin, Whitehouse, Udall, Vitter, Barrasso.

OPENING STATEMENT OF HON. THOMAS R. CARPER, U.S. SENATOR FROM THE STATE OF DELAWARE

Senator CARPER. Good morning, one and all. The hearing will come to order.

We want to welcome all of our witnesses. Thank you for joining us today, for your preparation and your willingness to respond to our questions.

We don't get to do this every day, I am delighted to be here with our friend, Senator Tom Udall. We are going to have this joint hearing today to review the impacts of air pollution on children's health in the United States of America.

Senators will have roughly 5 minutes for their opening statements. I will then recognize our panel of witnesses and we will ask each of you to use about 5 minutes for your opening statements, too. Your entire statement will be made part of the record. So if you could summarize and try to keep within that time constraint, that would be good. And after the panel's statements, we will have maybe two rounds of questions.

We are reminded today, as the temperatures approach 100 degrees here in our Nation's capital that summer is here. That means kids, I don't know today, are kids outside swimming? If there is a swimming pool around they will be there. But playing baseball and eating barbecue on the patio, maybe inside in the air conditioning. But in many parts of our Country, summer also means smog and exposure to deadly air pollution.

The summer smog season, also known as the ozone season, is a powerful reminder of how important it is to have clean air to breathe. Smog-causing air pollution from dirty power plants, from automobiles and other sources, is linked to serious health prob-

lems, like asthma, like strokes, like heart attacks, and even early deaths.

Smog is especially dangerous, as we know, for our children. Parents who have watched their kids with asthma suffer on high ozone days know this better than anyone. And some of them are here today.

Unfortunately, smog is not all we have to be concerned about when it comes to our children's health. Millions of our kids ride a bus to school, play on a playground or live in a community that exposes them to high levels of ozone, to particle pollution or air toxics, all of which can severely impact children's health. In fact, nearly all air pollution is more dangerous to our children than to their parents for three primary reasons. One, the immune systems of children are still developing. And two, they breathe in more air in proportion to their body size than do their parents. And three, they are more likely to be outside for longer periods of time during the summer, exposing them to more air pollution.

As a parent myself of two boys, now grown, I have spent a lot of time worrying about our own children's health. As a U.S. Senator, I also worry about every child's health. That is why I have worked hard with my colleagues, Democrat and Republican alike, to make sure that all of our children have clean air to breathe, that is free of all types of air pollution.

And we have made remarkable progress in cleaning up our air, especially in some parts of our Country. But if truth be told, we still have a long way to go in many other parts of America. More than 7 million American children have asthma, including nearly 28,000 in Delaware. Childhood asthma rates are still rising.

In fact, in Delaware alone, each of our three counties received a failing grade from the American Lung Association for the number of high pollution days they have experienced. For me, that is just more than disappointing, it is almost heart-breaking. I am not too old to remember one of the great things about being a kid, especially in summer, was getting to run and play outside. In fact, I still love to run distances with my oldest son, 22 years old. And even though he runs me into the ground, few things are better than that.

But kids with asthma get left behind on poor air quality days. Frequently they have to give up fun as well as healthy exercise. They often have to restrict their most basic daily activities. Moreover, those kids may have to miss school. Their parents may have to miss work. And all the while, health care costs in America, already the highest in the world, continue to rise.

Those costs add up to trillions of dollars lost every year in this Country. That is not millions; that is not billions; that is trillions with a T. The Environmental Protection Agency is now considering what I think are sensible rules to reduce smog-causing pollution as well as particle pollution, mercury pollution and other harmful air toxics. For example, reduce air toxic regulation for utilities would limit emissions of known toxics that affect the development of a child's brain or nervous system or affect the way a child's body develops. These rules can give us all cleaner air while reducing those pollutants that will help prevent a wide variety of health, serious health threats to our children.

And in the end, we stand to achieve better health care results for less money. That si right, better health care results for less money. It is my hope that today's witnesses will provide us with new information and insights on what our Federal Government is doing well and maybe what we are not doing so well, so we can enhance the quality of our Nation's air and protect the health and welfare of their systems, especially our Nation's children.

Five minutes, on the money. Senator Udall, match that. Thank you. Oh, sorry, Jim, I got carried away, John, I got carried away. You are on.

[The prepared statement of Senator Carper follows:]

STATEMENT OF HON. THOMAS R. CARPER, U.S. SENATOR
FROM THE STATE OF DELAWARE

Summer is here, and that means kids outside swimming, playing baseball, and eating bar-b-que on the patio. But in many parts of our country, summer also means smog and exposure to deadly air pollution.The summer smog season—also known as the ozone season—is a powerful reminder of how important it is to have clean air to breathe.

Smog-causing air pollution from dirty power plants, automobiles, and other sources is linked to serious health problems like asthma, strokes, heart attacks—and even early deaths. Smog is especially dangerous for our children. Parents who have watched their kids with asthma suffer on high ozone days know this better than anyone.

Unfortunately, smog is not all we have to be concerned about when it comes to our children's health. Millions of our kids ride a bus to school, play on a playground or live in a community that exposes them to high levels of ozone, particle pollution or air toxics—all of which can severely impact children's health.

In fact, nearly all air pollution is more dangerous to our children than to their parents for three primary reasons:

1. Their immune systems are still developing;
2. They breathe in more air in proportion to their body size than do their parents; and,
3. They are more likely to be outside for longer periods of time during the summer, exposing them to more air pollution.

As a parent, I've spent a lot of time worrying about my own children's health. As a U.S. Senator, I worry about every child's health. That's why I've worked so hard with my colleagues—Democrat and Republicans alike—to make sure that all our children have clean air to breathe, air that's free of all types of air pollution. We have made remarkable progress in cleaning up our air, especially in some parts of our country, but—if truth be told—we still have a long way to go in many parts of America.

More than 7 million American children have asthma—including nearly 28,000 in Delaware—and childhood asthma rates are still rising. In fact, in Delaware alone, each of our three counties received a failing grade from the American Lung Association for the number of high pollution days they have experienced. That's more than disappointing to me. It's almost heartbreaking. I'm not too old to remember that one of the great things about being a kid is getting to run and play outside. In fact, I still love to run distances with my oldest son who's now 22 years old. Few things in life are better.

But kids with asthma get left behind on poor air quality days. Frequently, they have to give up fun as well as healthy exercise. They often have to restrict their most basic daily activities. Moreover, those kids may have to miss school. Their parents may have to miss work. And, all the while, health care costs in America—already the highest in the world—continue to rise. Those costs add up, too, to trillions of dollars lost every year in this country. That's not millions. It's not billions. It's "trillions" with a "t."

The Environmental Protection Agency is now considering sensible rules to reduce smog-causing pollution, as well as particle pollution, mercury pollution and other harmful air toxics. For example, recent air toxic regulations for utilities would limit emissions of known toxics that affect the development of a child's brain or nervous system or affect the way a child's body develops.

These rules can give us all cleaner air, while reducing these pollutants will help prevent a wide variety of serious health threats to our children. And, in the end,

we stand to achieve better health care results for less money. That's right. Better results for less money. It is my hope that today's witnesses will provide us with new information and insights on what our Federal Government is doing well—and not doing well—so we can enhance the quality our nation's air and protect the health and welfare of our citizens, especially our nation's children.

Thank you.

OPENING STATEMENT OF HON. JOHN BARRASSO, U.S. SENATOR FROM THE STATE OF WYOMING

Senator BARRASSO. Thank you very much, Mr. Chairman.

We truly have a number of concerns and problems that we need to address in this Country. The most important problem facing America today, in my opinion, is actually high unemployment and a weak economy. Clean air is always important, and at times it has been paramount. The EPA of preceding generations fought the obvious pollution that was visible in our cities. It was a crisis, and thanks to the hard work of the EPA, that challenge was answered.

America's air now is cleaner than ever before. According to the EPA, over the last 30 years, carbon monoxide is down 61 percent, lead is down 97 percent, nitrogen oxide is down 48 percent, sulfur dioxide down 65 percent, particulate matter number 10 is down 83 percent. Today, the crisis is the economy and jobs. Unemployment is 9.1 percent. That means over 9 percent of Americans who want to work can't find an employer. Millions of Americans are unemployed, looking for work to provide for their families. Many families with children are sliding into poverty, as their bills pile up.

So I believe that our job in the Senate is to make sure things don't get worse and make sure that we create an economic environment where things actually can get better.

Yet today's EPA is unleashing a cascade of intersecting regulations that continues to drop a hammer on an already faltering economy. For example, the EPA's proposed ozone standard alone, according to the EPA's own numbers, will cost up to $90 billion per year in compliance costs by the year 2020. I didn't believe it, I rechecked the statistics twice that came out of the EPA. Ninety billion dollars a year in compliance costs by the year 2020.

Most of the counties in our Nation will be in violation of the law if these strictest standards being proposed are adopted by the EPA. Economic activity in these counties across the Country that are in violation will grind to a halt. These areas will be closed to many new types of businesses or expansion of existing businesses that are manufacturing-intensive. This will occur because potential employers will not want to do business in these communities where the EPA is the gatekeeper in moving forward with any economic activity. The result will be jobs leaving the heartland of our Country to go to India or to China. These are the very types of jobs that we need so desperately.

Children's health is always important. The future of children depends on their parents' ability to put food on the table, keep the lights on, support their education and their medical costs. In order to accomplish this, two key things are important. I believe children are best served when their parents have good paying jobs with benefits. I believe also that families benefit when they have affordable energy. Energy costs are taking up a larger share of household in-

come, and it is often those most in need who are bearing the burden.

According to the U.S. Department of Energy, on average Americans spend 5 percent of their income on paying energy bills. However, for lower income households, the costs average 18 to 20 percent and can be higher than that. High energy costs will result from the regulatory freight train of EPA regulations coming down the track. The net result will be the closing of some of America's affordable power plants and replacing them with more expensive power. Other plants will make costly upgrades and pass those costs on to families. This has already begun to occur.

Most recently, Louisville Gas and Electric in Kentucky has filed for a 19 percent rate increase by 2016 to pay for the upgrades that the EPA regulations will require. Those high costs will be passed right to the families with children who can afford it the least.

According to the National Center for Health Statistics, American children in poverty are 3.6 times more likely than non-poor children to have poor health and five times more likely to die from an infectious disease. When we talk about children's health, we need to talk about their families' economic situation and economic well-being. The health of those children and their future depends upon the families' economic well-being.

I think we need to focus on making America's air as clean as we can as fast as we can. And let us do it in a way that doesn't hurt American families during this economic situation. I thank you, Mr. Chairman, and look forward to the testimony.

Senator CARPER. Thank you, Senator Barrasso.

Senator Udall, welcome. Thanks for letting us do this with you today.

OPENING STATEMENT OF HON. TOM UDALL, U.S. SENATOR FROM THE STATE OF NEW MEXICO

Senator UDALL. This is a real pleasure doing this jointly with you.

Senator CARPER. I call it a cheap thrill.

[Laughter.]

Senator UDALL. Cheap thrill, right.

First, let me thank all of our witnesses and welcome everyone to the first meeting of the Subcommittee on Children's Health this year. I am pleased to be joining Chairman Carper for his joint subcommittee hearing on the important issue of air quality and children's health.

I would like to give a special welcome to Dr. Dona Upson, who has taken time off from her important job treating patients to travel all the way here from Albuquerque, New Mexico. It is good to have you here, and I know that you are a busy pulmonologist, so I know you have given up some important things to be here.

As her testimony indicates, she is testifying on behalf of the American Lung Association and the American Thoracic Association. It is always sound advice to listen to your doctor. While her testimony here today is not connected with her official duties, I want to make sure to thank her for her service treating veterans at the New Mexico Veterans Medical Center.

I think it is important to note that she also has valuable experience in air quality policy as a member of the Albuquerque Bernalillo Air Quality Board.

We have asked our panel to testify here today about the current State of medical and scientific evidence regarding air pollution and children's health. The last major revision to the Clean Air Act was in 1990. And the various standards from the Act have been gradually implemented since then. Some standards required by that Act, such as air toxics standards, are only now being proposed over 20 years later. Other standards, like ground level ozone, are coming up for an update to reflect the best scientific information.

In the Four Corners region in the west, EPA is moving forward with a regional haze air quality standard for large power plants. We are following those efforts carefully. Following the Supreme Court's 2007 decision, EPA is also charged with setting standards on global warming pollution for large emitters. Earlier this year, the House passed a budget, which would have blocked or delayed several of these air pollution standards. And the Senate voted against that proposal.

During the last few months, my office has received hundreds and hundreds of emails and calls in support of the Clean Air Act. Several emails were from constituents and parents of children with asthma, with deep concern about the impact of those proposals on their lungs. Media reports indicate that further legislation is being drafted in both the House and the Senate. These bills would block or delay not only the global warming pollution standards, but also other standards as well.

This hearing will provide an opportunity for members and the public to hear from public health professionals about the impacts of air pollution on children's health. And with that, Chairman Carper, I look forward to the testimony of the witnesses. Thank you.

Senator CARPER. Thanks. I am happy to be here to be your wing many today.

Senator Inhofe, please.

OPENING STATEMENT OF HON. JAMES M. INHOFE, U.S. SENATOR FROM THE STATE OF OKLAHOMA

Senator INHOFE. Thank you, Mr. Chairman. It is nice to have you back, Dr. Thorning. We have imposed upon you quite a bit. And we hope, Dr. Upson, that the fires don't reach New Mexico. It is a real tragedy, what is going on there.

I think we all agree that we are concerned with children's health. I should have brought my own chart. These are my 20 kids and grandkids, so that is my concern. So I have that concern.

I think one of the concerns that we have up here, and I agree with what Senator Barrasso said, we have these hearings, and they seem to be hearings focusing on the issues that this Administration has. And I think when you look at what the Administration has been doing, all this over-regulation and the cost of which I am sure we will get to in the testimony of Dr. Thorning, it comes to the conclusion that this Administration, by their own admission, wants to increase the price of energy that is out there today.

Steven Chu said, somehow we have got to figure out how to boost the price of gasoline to the levels of those in Europe. He is the En-

ergy Secretary for this President. I think the idea is so unbelievable to normal people, when you get out of Washington, DC, and get back home and talk to them, it is mind-boggling. The advocates of the agenda hope that strict regulations can be used to choke off traditional energy sources. We see this, we see this every day. Over the past 2 years, the EPA has moved forward with an unprecedented number of rules that will have enormous consequences on families and businesses and the Nation's fiscal well-being.

It wasn't long about, about 8 months ago, that the CRA, that is congressional Review Act, came out with a study. No one questioned it, everyone agrees it is accurate, and that is that America, the United States of America, has the greatest reserves in oil, coal and gas of any country in the world. Our problem is we are the only country that won't develop our own resources. That is the concern that we have and I have for the future generations. I think we will get around to this, because people are now realizing that over-regulation does come with a cost.

I listened carefully as Senator Barrasso talked about some of the costs. I would like to share those and have them as a part of this record. Incidentally, I am going to ask that my entire statement, along with the four pages of subsequent material, be made a part of the record.

Senator CARPER. Without objection, so ordered.

Senator INHOFE. The greenhouse gas regulations, we are looking at a cost, a potential cost to the American people annually of between $300 billion and $400 billion dollars. This is something that came from the Wharton Econometric Survey, MIT and others. The ozone, it is true, what Senator Barrasso said about the $90 billion in compliance. But in addition to that, it is $676 billion in loss of GDP by 2020.

The Boiler MACT is another one that would be a hardship on all manufacturing. I am sure we will hear from Dr. Thorning about that. Utility MACT, $184 billion in compliance costs between 2011 and 2030. The Cement MACT—now, these have all been fortunately postponed for a short period of time. I hope that is an indication that the Administration realizes that we have economic problems enough without imposing more economic problems on our Country.

So with that, I am going to go ahead—oh, one last thing. In the oil and gas end of it, I thought it was interesting when President Obama gave his energy speech and I gave a response on one of the television stations, and he had said, we have this abundance of clean, inexpensive natural gas, right here in our Country. Then at the end of his speech, he said, we have to watch these procedures, such as hydraulic fracturing. Well, everybody knows that in these tight formations that they have right now, there is no way of getting out any of that without using hydraulic fracturing. Since I am from Oklahoma, we did the first hydraulic fracturing job in Oklahoma in 1948. There has never been one documented case of groundwater contamination as a result of that.

So it just seems to me that those things that sound good to the public always have a little caveat. We are going to be watching very closely from this Committee. I am hoping that the Committee meeting next week, where we are going to have Administration of-

ficials, will be able to get into a lot of these things as to what is motivating them to pass these regulations and try to impose these regulations, keeping in mind, whether it is the Clean Water Restoration Act, whether it is cap and trade, these are things that they are trying to do through the Administration, since they can't get it done through legislation.

Certainly I would say to my good friend, Senator Udall, that when he talked about the fact that we have all these things with cap and trade and greenhouse gases and global warming and all that, we have had several votes. I think the wisdom of the Senate is that not more than 30 members of a 100-member Senate will vote to impose that type of cap and trade and those restrictions that would damage our economy.

Thank you, Mr. Chairman.

[The prepared statement of Senator Inhofe follows:]

STATEMENT OF HON. JAMES M. INHOFE, U.S. SENATOR FROM THE STATE OF OKLAHOMA

Today's subcommittee hearing is the third in a series of hearings designed to prop up the Obama EPA's aggressive regulatory regime. This hearing nominally focuses on air quality and children's health. But there is no question that we all support clean air and that we all care for the well-being of children.

Taken at face value, one might assume the Obama EPA has only the public good in mind. But the truth about Obama's regulatory agenda is inescapable: it's designed make the energy we use more expensive.

But don't take my word for it. The Energy Secretary Stephen Chu said in 2008, "[s]omehow we have to figure out how to boost the price of gasoline to the levels in Europe" and don't forget that the President himself stated that under his cap-and-trade plan "electricity prices would necessarily skyrocket."

Advocates for this agenda hope that strict regulations can be used to choke off traditional, American energy so that prices will increase to the point that "green" energy is the only alternative. But these green subsidies are undermining the economy and hurting working families.

Over the past 2 years, EPA has moved forward with an unprecedented number of rules that will have enormous consequences for families, businesses, and the nation's fiscal well-being. Known as the "EPA train wreck," this regulatory agenda is driving energy costs up, and hitting those who can least afford it—the working poor, the elderly, and veterans—the hardest.

Take for example, EPA's new greenhouse gas (GHG) cap and trade regulations. EPA admits they will have no impact on global temperatures, yet they will come at an estimated cost of $300 to $400 billion annually. The Agency's voluntary reconsideration of the national ambient air quality standards for ground-level ozone—a decision based on outdated data that could lead to significant economic constraints on the country—is another Agency action of dubious merit. EPA projects the cost of this rule could rise to $90 billion. Meanwhile, the agency is planning to tighten the standards again in just 2 years.

The EPA is also aggressively moving forward with standards to reduce hazardous air emissions from industrial boilers, cement manufacturers and from electric power generators. Now, reducing hazardous emissions is a goal that we all support. But alarmingly, the benefits the EPA associates with the rules come almost entirely from reducing particulate matter (PM)—not the hazardous emissions. So here we have the Agency justifying new mandates that will cost thousands of jobs on PM benefits—even though we already have a specific program designed to address PM directly, the national ambient air quality standard for PM.

Recently, I called for this Committee to fulfill its oversight responsibilities and hold hearings on EPA's "train wreck" regulations. Yet, we are having a hearing next week whose title, ominously, resembles that of today's. Chairwoman Boxer, in the coming weeks I look forward to working with you on additional oversight hearings where we can begin to take a detailed look at the Obama EPA's aggressive regulatory agenda.

Senator CARPER. Thank you, Senator Inhofe.

Senator WHITEHOUSE.

OPENING STATEMENT OF HON. SHELDON WHITEHOUSE, U.S. SENATOR FROM THE STATE OF RHODE ISLAND

Senator WHITEHOUSE. Thank you, Chairman. Thank you to you and Senator Udall for holding this important hearing. I am delighted that Jim Ginda is here from Rhode Island to share his expertise. I think it is important that we have a hearing like this where the perspective of children can be heard.

EPA is updating air quality standards and setting first-ever Federal air toxic air pollution limits from power plants. That is a good thing, because these are long overdue. They have been mired in litigation and deliberately undermined by the last Administration. But they are supported by the science, they are supported by public health. And they are real costs of further delay.

Our Rhode Island Department of Health reports that 11 percent of children in Rhode Island have asthma. Nearly 14 percent of our teens have asthma. You get into certain local areas and populations, those numbers climb even further. But just as they are, that translates into 25,000 children in our State of 1 million. That is more than the entire population of towns in Rhode Island like Central Falls, Lincoln, and Westerly. And these children, frankly, are not heard. And the costs to them are not heard.

The polluting industries are always heard loud and clear in this town. There has already been a lot of talk about compliance costs here in this hearing. But there are real health savings that come from these compliance costs, and they usually outweigh the compliance costs by huge factors. And asthma does mean costs. It means costs in human terms, as anybody who has seen a child struggling for breath knows. But it also has real economic costs.

The recent report in Rhode Island showed that in 2006 and 2007, the total hospital charges attributable just to asthma were $35 million. That is just the hard hospital charges, not the kids out of school, not the parents who had to stay home who couldn't work that day because they had to take care of it. There are costs on the health savings side if we don't take these appropriate steps.

Two doctors on Brown University's faculty have found a significant association between pediatric emergency department visits for respiratory related conditions on the one hand and exposure to fine particulate matter on the other. We in Rhode Island are downwind of an array of power plants, many of which have no pollution controls whatsoever, many of which have resorted to high smokestacks to pump their pollution up into the sky, protecting their own communities, but leaving Rhode Island vulnerable to being basically bombarded.

It is not unusual to drive to work and have the drive time radio in Rhode Island, Mr. Chairman, say that today is a bad air day. And infants should be kept indoors, elderly should be kept indoors, people with respiratory conditions should be kept indoors. And you look around, it looks like a beautiful day. But it is ozone that has precipitated down as a result of power plants, primarily in the Midwest, without pollution controls, that have elected to dump it on our State rather than clean it up in their State.

A pediatric pulmonologist at Hasbro Children's Hospital in Providence, Rhode Island, recently told my office that kids' health issues are too often overlooked because, he said, "Kids have no money,

and they don't vote." Well, the big polluters have plenty of money and plenty of lobbyists, and they get their voices heard. We hear a ton, as I said, about compliance costs on the polluting industry. But we need to also hear about the health savings, both in lives and in quality of life and in hard economic dollars as well, which lift our economy by multiple times the compliance cost when we take care of ourselves, of our children, of our lungs.

So thank you very much for holding this hearing.

Senator CARPER. Senator Whitehouse, we are delighted to be here with you, very much.

I am going to introduce four of the five panelists, and I am going to call on Senator Whitehouse to introduce our witness from Rhode Island.

Today, joining us on the panel is Dr. Dona Upson. My grandmother's name is Doma, D-O-M-A, so when I saw your name, I said, oh, must be Dona. Fortunately, Senator Udall reined me in. So Dr. Dona Upson, we are happy you are here. A board member, I am told, at the American Lung Association of New Mexico. Thanks for your good work.

Next, Senator Whitehouse, your turn.

Senator WHITEHOUSE. Do I get to do my introduction right now?

Senator CARPER. You are on.

Senator WHITEHOUSE. Very good. Well, we want to welcome Jim Ginda here. He is a registered respiratory therapist, a certified asthma educator, a certified health education specialist with over 33 years in health care. He is the respiratory care supervisor at Kent Hospital in Warwick, Rhode Island, and a clinical instructor for the Community College of Rhode Island. He received his associate and applied science degree from the Community College of Rhode Island, bachelor of science degree from Western Michigan University and his MA from the University of Alabama, with National Honor Society induction as a graduate student.

In Rhode Island, he is past president of the Rhode Island Society for Respiratory Care, a past member and chair of the State Board of Respiratory Care, and he was a member of the Health Care Advisory Board for TMP Worldwide. He has participated in the Medical Aerosol Focus Group in Canada, he lectured in 11 different States. He has written for national publications, provided expert opinion in nine medical legal cases in four other States. He is a member of the Rhode Island Public Policy Committee for the American Lung Association and the Rhode Island Asthma Control Coalition.

He has provided testimony on these issues for committees of the Rhode Island General Assembly and the Providence City Council. He is a recipient of the Hospital Association of Rhode Island Award for Excellence in Hospital Care, and the Rhode Island Society for Respiratory Care Lifetime Achievement Award. We are very proud to have him here in Washington sharing his perspective.

Senator CARPER. Thanks for that introduction.

Next we have Dr. Julie Goodman. I understand Dr. Goodman is a Principal at Gradient Environmental Consulting. Good morning and welcome.

Next, Dr. Margo Thorning, no stranger here. It is nice to see you. She serves as a Senior Vice President at the American Council for Capital Formation.

And finally, we have a familiar face, at least to those of us in Delaware, Patty Resnik, from my home State, the Corporate Director for Performance Improvement in Utilization Management at the Christiana Care Health System, a place we are very proud of.

Again, we would ask each of you to try to limit your comments to about 5 minutes. If you go much over that, I will have to rein you in. But your entire statement will be made part of the record, so please proceed. Again, thank you all for coming.

Dr. Upson.

STATEMENT OF DONA J. UPSON, M.D., M.A., PULMONARY/CRITICAL CARE PHYSICIAN

Dr. UPSON. Good morning. Thank you, Chairman Carper, Chairman Udall and Senators, for this opportunity to speak with you today. My name, as you mentioned, is Dr. Dona Upson. I am a pulmonary and critical care physician form Albuquerque, New Mexico.

I am speaking today on behalf of the American Lung Association and the American Thoracic Society. I would like to speak to you as a doctor and a mother about children and their lungs.

I am here to tell you that children my look like miniature adults, but they are not. For many reasons, they deserve special attention and protection, including the clean-up of major pollution sources in the Nation.

Air pollution is especially dangerous to children, because their lungs are growing and because they are so active. Just like their arms and legs, the largest portion of children's lungs grow long after they are born. As Senator Carper mentioned, children are outside for longer periods and are more active, especially in the summer when ozone levels are highest. They inhale more polluted outdoor air than do adults.

The American Academy of Pediatrics has issued a special statement on the dangers of outdoor air pollution on children's health. The conclude that there is a compelling need to move forward on efforts to ensure clean air for all. I absolutely agree. I am attaching a copy of their statement.

Children's lungs are vulnerable to air pollution, especially from ozone and particulate matter. Multiple studies, both in the United States and around the world, have provided strong, consistent evidence that air pollution impairs children's ability to breathe. Chamber studies have convincingly shown that exposure to air pollution reduces pulmonary function and promotes airway inflammation. Epidemiologic studies have linked air pollution to a host of adverse health consequences, including cardiac deaths, respiratory deaths, heart attacks, asthma exacerbations and low birth weight.

There is also real world evidence that reducing air pollution can help protect children. One of the best known examples is from Atlanta, during the 1996 Olympics, when a reduction in ozone was linked to a 42 percent decrease in asthma treatment and hospitalization in the Georgia Medicaid claims files.

In New Mexico alone, where I practice, 47,000 kids have asthma. Similar to the adults I treat, having asthma puts children at even

greater risk of harm. One example of this from my own experience came several years ago when I was the medical director of a 2-week asthma camp for children in New Mexico. We had to cancel the camp due to the high level of pollution from wildfires from Arizona, similar to what we are seeing this past week.

What is most impressive about the scientific literature on air pollution is how comprehensive it is, with literally hundreds of studies documenting that air pollution is bad for human health. To date, most of these have looked at the health effects of individual components of air pollution, such as ozone. However, in real life, we breath a whole mix of pollutants together. It is quite likely that when the mix of pollutants is more thoroughly investigated, even greater impacts on health will be seen.

Some would lead you to believe that cleaning up ozone, mercury, lead, arsenic, dioxin, acid gases, as well as carbon pollution, is unnecessary or just too expensive. Yet it is not hard to fathom how breathing toxins can lead to serious health complications. But we don't have to make a choice between protecting our environment and our communities and our economy. Let me give you a New Mexico example.

Coal and oil-fired power plants are some of the biggest sources of air pollution in the United States. The Four Corners power plant is the Nation's largest source of nitrogen oxides, a pollutant that is one of the precursors for both fine particulate matter and ozone. Pollution from the plant blows directly into the Navajo Nation and into our national parks.

In February, the EPA and the plant's owner, Arizona Public Service, announced an agreement to cut emissions of that harmful pollutant by 87 percent, all while retaining the jobs of the workers, most of whom are Native American. When these changes are made, the cleanup measures will reduce air pollution, protect health, save lives and improve the view of the spectacular New Mexico landscape.

EPA is proposing to take similar steps for power plants across the Nation, steps that will improve health and save tens of thousands of lives, reducing harm from the air we all breathe. The Clean Air Transport Rule will protect downwind States in the eastern United States from nitrogen oxides that blow across State lines.

This fall, 21 years after this United States required the cleanup of toxic mercury, arsenic, formaldehyde, dioxins and 80 other pollutants, the EPA will be issuing final rules to set limits on the amount of these pollutants that coal and oil-fired power plants can emit. The Clean Air Act has a proven track record of keeping people healthy. In 2010, the law prevented 160,000 premature deaths and 1.7 million asthma attacks.

In conclusion, the danger from exposure to air pollution is real. The science documenting the adverse health effects of air pollution is conclusive. There is an urgent need to clean up the air we breathe. For all these reasons, the American Lung Association and the American Thoracic Society strongly support the Clean Air Act as one of the Nation's best tools to protect our children.

Thank you.

[The prepared statement of Dr. Upson follows:]

Statement of
Dona J. Upson, MD, MA
Albuquerque, New Mexico
On Behalf of the American Lung Association and
the American Thoracic Society

Before the
Senate Committee on Environment and Public Works
Subcommittee on Clean Air and Nuclear Safety and Subcommittee on Children's Health and Environmental Responsibility
"Air Quality and Children's Health" Hearing
Washington, D.C.

June 8, 2011

Good morning. Thank you, Chairman Carper, Chairman Udall and Senators, for this opportunity to speak with you today. My name is Dr. Dona Upson. I am a pulmonary/critical care physician from Albuquerque, New Mexico.

I am speaking today on behalf of the American Lung Association and the American Thoracic Society. The American Lung Association is the nation's oldest voluntary health organization, whose mission is to save lives by improving lung health and preventing lung disease. The American Thoracic Society is a medical professional organization of over 15,000 physicians, researchers and allied health professionals dedicated to the prevention, detection, treatment and cure of respiratory, sleep and critical care illnesses through research, education and advocacy. I serve on the Nationwide Assembly of the American Lung Association and the National Board of Directors of the American Thoracic Society.

I'd like to speak to you today about children and their lungs. I'm a pulmonologist and critical care physician, and I'm a mother. I'm here to tell you that children may look like miniature adults, but they're not. For many reasons, they deserve special protection, including the cleanup of major pollution sources in the nation—most particularly, power plants. Power plants add hundreds of thousands of tons of dangerous air pollution to the air, threatening the most vulnerable among us, our children.

Air pollution is especially dangerous to children because their lungs are growing and because they are so active. Just like the arms and legs, the largest portion of a child's lungs will grow long after he or she is born. Eighty percent of their tiny air sacs develop after birth. Those sacs, called alveoli, are where the life-sustaining transfer of oxygen to the blood takes place. The lungs and their alveoli aren't fully grown until children become adults.[1] In addition, the body's

defenses that help adults fight off infections are still developing in young bodies.[2] Children have more respiratory infections than adults, which also seems to increase their susceptibility to air pollution.[3]

Furthermore, children don't behave like adults, and their behavior also affects their vulnerability. They are outside for longer periods and are usually more active when outdoors, especially in the summer when ozone levels are higher. Consequently, they inhale more polluted outdoor air than adults typically do.[4]

In 2004, the American Academy of Pediatrics issued a special statement on the dangers of outdoor air pollution on children's health, pointing out the special differences for children.[5] In their analysis, they conclude that "There is a compelling need to move forward on efforts to ensure clean air for all."[6] I absolutely agree. I'm attaching a copy of their statement, which they reaffirmed in April 2009, to my comments.

Children's lungs are vulnerable to air pollution, especially from ozone and particulate matter. Multiple studies, both in the United States and around the world, have provided strong, consistent evidence that air pollution impairs children's ability to breathe. For example, repeated testing of school children in three California communities showed that even breathing at ozone levels during the school year, which are lower than during the summer, reduced their measured lung function (FEV_1) as pollution increased during the day. [7]

Community health studies point to less obvious, but serious effects from year-round exposure to ozone, especially for children. Scientists followed 500 Yale University students and determined that living just four years in a region with high levels of ozone and related co-pollutants was associated with diminished lung function and frequent reports of respiratory symptoms.[8]

Abundant and clear peer-reviewed research demonstrates that air pollution harms health. Chamber studies have convincingly shown that exposure to air pollution reduces pulmonary function and promotes airway inflammation. Epidemiological studies have linked air pollution to a host of adverse health consequences, including cardiac deaths, respiratory deaths, heart attacks, vascular remodeling, COPD exacerbations, asthma exacerbations and low birth weights. There is also real-world evidence that reducing air pollution can help protect children.

One of the best known examples is from Atlanta during the 1996 Olympics, when a reduction in ozone was linked to a 42-percent decrease in asthma treatment and hospitalization in the Georgia Medicaid claims files. Pediatric Emergency Departments also saw significant reductions, as did the Georgia Hospital Discharge Database and a health maintenance organization database.[9]

Other real-world studies have shown similar findings. Changes in air pollution from the reunification of Germany proved to be a real-life laboratory. Both East and West Germany had different levels and sources of particulate matter. Outdoor particle levels were much higher in East Germany, where they came from factories and homes. West Germany had higher concentrations of traffic-generated particles. After reunification, emissions from the factories and homes dropped, but traffic increased. A German study explored the impact on the lungs of six-year-olds from both East and West Germany. Total lung capacity improved with the lower particle levels. However, for children living near busy roads, the increased pollution from the increased traffic kept them from benefiting from the overall cleaner air.[10]

In Switzerland, particle pollution dropped during a period in the 1990s. Researchers there tracked 9,000 children over a nine-year period, following their respiratory symptoms. After taking factors such as family characteristics and indoor air pollution into account, the researchers found that during the years with less pollution, the children had fewer episodes of chronic cough, bronchitis, common cold, and conjunctivitis symptoms.[11]

The evidence is even more compelling when you focus on children who have lung disease, such as asthma. In New Mexico alone, 47,000 kids have asthma. Similar to the adults I treat, having asthma puts children at even greater risk of harm. One example of this from my own experience came several years ago, when I was the Medical Director of a two-week asthma camp for children in New Mexico. We had to cancel the camp due to high levels of pollution from wildfires in Arizona. Many epidemiological studies have shown that particulate matter—like the soot from those wildfires—as well as ozone, and other pollutants increase "a wide variety of respiratory symptoms . . . in children" as concluded by the U.S. EPA in a 2006 review of all pertinent research on ozone.[12]

Many studies have found that higher levels of ozone and other pollutants increase the number of pediatric hospital admissions. A 2008 New York City study of hospital admissions for respiratory disease among children under age 18 found an association with higher outdoor ozone levels in five of the 11 regions included in the study.[13] A similar, but much larger study of 11 cities in Canada—not widely known for its ozone problems—found a increase in neonatal respiratory admissions with increases in ozone.[14]

What is most impressive about the scientific literature on air pollution is how comprehensive it is, with literally hundreds of studies documenting that air pollution, in its various forms, is bad for human health. The research has proven to be consistent over decades. Scientists have been able to apply improved research technologies to document the health effects of air pollution at consistently smaller doses. Furthermore, to-date, most studies have looked at the health effects of individual components of air pollution, such as ozone. The National Ambient Air Quality

Standard defines what constitutes air that is healthy to breathe and safe for the environment for the most common and widespread air pollutants in terms of single pollutant criteria. However, as happens in real life, we breathe a whole mix of pollutants together. It is quite likely that, when the mix of pollutants is more thoroughly investigated, even greater impacts on health will be seen.

Some would lead you to believe that cleaning up ozone, mercury, lead, arsenic, dioxin and acid gases, as well as carbon pollution, in our air, is unnecessary, or just too expensive. Yet it's not hard to fathom how breathing toxins can lead to serious health complications, and are in fact directly linked to cancer, heart disease, neurological damage, birth defects, asthma attacks and even premature death.

But we don't have to make a choice between protecting our communities and our economy. Let me give you a New Mexico example.

Coal- and oil-fired power plants are some of the biggest sources of air pollution in the United States, especially in the Midwest, Southeast and Northeast, but also in places like the Four Corners of the Southwest. According to the EPA, the Four Corners Power Plant is the nation's largest source of nitrogen oxides, a pollutant that is one of the precursors for both fine particulate matter and ozone, and harmful on its own. Pollution from the plant blows directly into the Navajo Nation and into our national parks. Fortunately, in February the EPA and the plant's owner, Arizona Public Service, announced an agreement to cut emissions of that harmful pollutant by 87 percent, all while retaining the jobs of the workers who keep the plant fueled and operating, most of whom are Native American.[15] When these changes are made, the cleanup measures will reduce air pollution, protect health, save lives and improve the view of the spectacular New Mexico landscape.

EPA is proposing to take similar steps for power plants across the nation, steps that will improve health and save tens of thousands of lives, reducing harm from the air we all breathe. The Clean Air Transport Rule, promised this summer, will protect downwind states in the eastern U.S. from nitrogen oxides that blow across state lines with similar relief to the plan for the Four Corners Plant. And at long last, 21 years after this United States Congress required the cleanup of toxic mercury, arsenic, formaldehyde, dioxins and 80 other pollutants, the EPA will be issuing final rules this fall to set limits on the amount of these pollutants that coal- and oil-fired power plants can emit.

When it comes to carbon pollution, the threat to our health is growing at an alarming pace. Carbon pollution is linked to warmer temperatures, which studies have shown, will increase the risk of unhealthful ozone levels. Even with the steps that are in place to reduce ozone, scientific

evidence warns that changes in climate are likely to increase ozone levels in the future in nearly every region of the United States. This is why the EPA is updating air pollution standards to address the dangers of too much carbon pollution, as required by a 2009 U.S. Supreme Court decision. To protect human health, the nation needs the Clean Air Act to stem the danger of climate change and increased ozone levels. Steps to reduce carbon pollution can be cost-saving over time. The solar panels I put on my house, and that we put on the roof of the building of the American Lung Association in New Mexico, will pay for themselves after 11 years; the new insulation after seven. New Mexico's new governor is trying to roll-back energy standards for new buildings, and is meeting opposition from many builders, who state that lower standards will increase costs in the long run.

The Clean Air Act, which has received bi-partisan support since it was established in 1970, has a proven track record of keeping people healthy; in 2010, the law prevented 160,000 premature deaths and 1.7 million asthma attacks. Medical studies have shown that toxins emitted by the burning of coal, oil and other sources result in premature death, pulmonary and cardiovascular inflammation, asthma attacks, heart attacks and strokes, especially among our most vulnerable — children, elderly, the impoverished and those already living with lung disease.

Moreover, clean air standards not only save Americans' lives, they save Americans' money. In 2010, it is estimated that due to averted medical bills and sick days, the EPA standards amounted to $1.3 trillion in costs savings. While some assert that clean air regulations unnecessarily burden businesses and industry, pumping toxic, harmful and life-threatening pollution into the air is not the only way to do business. Updating and strengthening air pollution standards not only reduces health care costs through improved public health, it also spurs innovation, opens opportunities for small businesses, and creates jobs across a range of skill levels.

In conclusion, the danger from exposure to air pollution is real, the science documenting the adverse health effects of air pollution is conclusive, the technology required to reduce air pollution is readily available and in use today. Congress's clear intent to protect public health with the Clean Air Act has proven successful through over 40 years of meaningful implementation. For all these reasons, the American Lung Association and the American Thoracic Society strongly support the Clean Air Act as one of the nation's best tools to protect our families and our children.

Thank you for your time and I would be happy to answer any questions.

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AMERICAN ACADEMY OF PEDIATRICS

POLICY STATEMENT
Organizational Principles to Guide and Define the Child Health Care System and/or Improve the Health of All Children

Committee on Environmental Health

Ambient Air Pollution: Health Hazards to Children

ABSTRACT. Ambient (outdoor) air pollution is now recognized as an important problem, both nationally and worldwide. Our scientific understanding of the spectrum of health effects of air pollution has increased, and numerous studies are finding important health effects from air pollution at levels once considered safe. Children and infants are among the most susceptible to many of the air pollutants. In addition to associations between air pollution and respiratory symptoms, asthma exacerbations, and asthma hospitalizations, recent studies have found links between air pollution and preterm birth, infant mortality, deficits in lung growth, and possibly, development of asthma. This policy statement summarizes the recent literature linking ambient air pollution to adverse health outcomes in children and includes a perspective on the current regulatory process. The statement provides advice to pediatricians on how to integrate issues regarding air quality and health into patient education and children's environmental health advocacy and concludes with recommendations to the government on promotion of effective air-pollution policies to ensure protection of children's health. ***Pediatrics* 2004;114:1699–1707; *air pollution, adverse effects, children, asthma, environmental health.***

ABBREVIATIONS. $PM_{2.5}$, particulate matter with a median aerodynamic diameter less than 2.5 μm; PM_{10}, particulate matter with a median aerodynamic diameter less than 10 μm; EPA, Environmental Protection Agency; HAP, hazardous air pollutant; AQI, air quality index.

INTRODUCTION

Although it has been 3 decades since passage of the Clean Air Act in 1970 (Pub L No. 91–604), the air in many parts of the United States is far from clean. Air quality has improved in some areas but decreased in others.[1] In addition, there are important health effects from air pollutants at levels once considered safe. Children and infants are among the most susceptible to many of the air pollutants.

In 2002, approximately 146 million Americans were living in areas where monitored air failed to meet the 1997 National Ambient Air Quality Standards for at least 1 of the 6 "criteria air pollutants": ozone, particulate matter, sulfur dioxide, nitrogen dioxide, carbon monoxide, and lead (Table 1).[1] Although the standards for ozone and particulate matter were revised in 1997, legal barriers have delayed timely implementation.[2] Recent reports have identified adverse health effects at levels near or below the current standards for ozone, particulate matter, and nitrogen dioxide. Thus, the 1997 federal standards may not adequately protect children. Additionally, numerous other toxic air pollutants are of public health concern.[3]

Outdoor air pollution is also a major problem in developing countries. The World Health Organization found that the air quality in large cities in many developing countries is remarkably poor and that very large numbers of people in those countries are exposed to ambient concentrations of air pollutants well above the World Health Organization guidelines for air quality (www.who.int/ceh/publications/en/11airpollution.pdf).

Scientific understanding of the health effects of air pollution, including effects on children, has increased in the last decade. This statement updates a 1993 American Academy of Pediatrics (AAP) statement titled "Ambient Air Pollution: Respiratory Hazards to Children."[4]

EFFECTS OF AIR POLLUTION ON CHILDREN

Children are more vulnerable to the adverse effects of air pollution than are adults. Eighty percent of alveoli are formed postnatally, and changes in the lung continue through adolescence.[5] During the early postneonatal period, the developing lung is highly susceptible to damage after exposure to environmental toxicants.[5–7]

Children have increased exposure to many air pollutants compared with adults because of higher minute ventilation and higher levels of physical activity.[8] Because children spend more time outdoors than do adults, they have increased exposure to outdoor air pollution.[9,10]

Infants, children, the elderly, and those with cardiopulmonary disease are among the most susceptible to adverse health effects from criteria pollutants.[11–15] Lead is neurotoxic, especially during early childhood. Carbon monoxide interferes with oxygen transport through the formation of carboxyhemoglobin. Other criteria pollutants (ozone, sulfur dioxide, particulate matter, nitrogen dioxide) have respiratory effects in children and adults, including increased respiratory tract illness, asthma exacerbations, and decreased lung function (eg, changes in peak flow).[11–12] In adults, particulate air pollution is associated with respiratory and cardiovascular hos-

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TABLE 1. National Ambient Air Quality Standards for Criteria Air Pollutants, 1997

Pollutant	Primary Standards*
Ozone	
1-h average	0.12 ppm (235 $\mu g/m^3$)
8-h average	0.08 ppm (157 $\mu g/m^3$)
PM_{10}	
Annual arithmetic mean	50 $\mu g/m^3$
24-h average	150 $\mu g/m^3$
$PM_{2.5}$	
Annual arithmetic mean	15 $\mu g/m^3$
24-h average	65 $\mu g/m^3$
Sulfur dioxide	
Annual arithmetic mean	0.03 ppm (80 $\mu g/m^3$)
24-h average	0.14 ppm (365 $\mu g/m^3$)
Nitrogen dioxide	
Annual arithmetic mean	0.053 ppm (100 $\mu g/m^3$)
Carbon monoxide	
8-h average	9 ppm (10 mg/m^3)
1-h average	35 ppm (40 mg/m^3)
Lead	
Quarterly average	1.5 $\mu g/m^3$

Additional information on air quality standards are available at www.epa.gov/air/criteria.html.
* People residing in regions with pollutant concentrations above the primary standard may experience adverse health effects from poor air quality.

pitalizations, cardiovascular mortality,[16] and lung cancer.[17] Air pollution also has effects on indirect health indicators such as health care utilization and school absences.[11–13]

Although numerous studies have shown that outdoor air pollution exacerbates asthma, the effect of outdoor air pollution on the development of asthma has been less clear. Recently, a prospective study found that the risk of developing asthma was not greater, overall, in children living in communities with high levels of ozone or particulate air pollution. However, in communities with high levels of ozone, there was an increased risk of developing asthma in a small subset of children involved in heavy exercise (participation in 3 or more team sports per year [relative risk: 3.3; 95% confidence interval: 1.9–5.8]). This increased risk with heavy exercise was not seen in low-ozone communities. Time spent outside was also associated with new cases of asthma in high-ozone communities (relative risk: 1.4; 95% confidence interval: 1.0–2.1) but not in low-ozone communities.[18] Additional studies are needed to define the role of outdoor air pollution in the development of asthma.

Children in communities with higher levels of urban air pollution (acid vapor, nitrogen dioxide, particulate matter with a median aerodynamic diameter less than 2.5 μm [$PM_{2.5}$], and elemental carbon [a component of diesel exhaust]) had decreased lung function growth, and children who spent more time outdoors had larger deficits in the growth rate of lung function.[19,20] Ambient air pollution (especially particulate matter with a median aerodynamic diameter less than 10 μm [PM_{10}]) has also been associated with several adverse birth outcomes, as discussed in the next section.

Levels of ozone and particulate matter are high enough in many parts of the United States to present health hazards to children.[1] Additionally, National Ambient Air Quality Standards for nitrogen dioxide may not be protective. Findings on these pollutants are summarized here.

Ozone

Ambient ozone is formed by the action of sunlight on nitrogen oxides and reactive hydrocarbons, both of which are emitted by motor vehicles and industrial sources. The levels tend to be highest on warm, sunny, windless days and often peak in midafternoon, when children are most likely to be playing outside.

Ozone is a powerful oxidant and respiratory tract irritant in adults and children, causing shortness of breath, chest pain when inhaling deeply, wheezing, and cough.[11] Children have decreases in lung function, increased respiratory tract symptoms, and asthma exacerbations on days with higher levels of ambient ozone.[11,21–23] Increases in ambient ozone have been associated with respiratory or asthma hospitalizations,[24,25] emergency department visits for asthma,[26] and school absences for respiratory tract illness.[27] In Atlanta, Georgia, summertime children's emergency department visits for asthma increased 37% after 6 days when ozone levels exceeded 0.11 ppm.[25] In southern California, school absences for respiratory tract illness increased 63% in association with a 0.02-ppm increase in ozone.[27]

In healthy adults, ozone causes airway inflammation and hyperreactivity, decrements in pulmonary function, and increased respiratory tract symptoms.[11] Ozone exposures at concentrations of 0.12 ppm or higher can result in decrements in lung function after subsequent challenge with aeroallergen.[28] Although most of the controlled studies of ozone exposure have been performed with adults, it is reasonable to believe that the results of these findings could be extended to children.

Ozone may be toxic at concentrations lower than 0.08 ppm, the current federal regulatory standard. Field studies suggest potential thresholds of between 0.04 and 0.08 ppm (1-hour average) for effects on lung function.[29–31] Recent studies of hospitalizations for respiratory tract illness in young children and emergency department visits for asthma suggest that the effects of ozone may occur at ambient concentrations below 0.09 ppm.[32,33] Another study found associations of ozone and respiratory symptoms in children with asthma at levels below the current US Environmental Protection Agency (EPA) standards.[34] If these findings are confirmed, the ozone standards may need additional revision.

In addition to studies on short-term effects, 2 recent studies of college freshmen suggest that increasing cumulative childhood exposure to ozone may affect lung function when exposed children reach young adulthood, particularly in measures of flow in small airways.[35,36] Early childhood exposures may, therefore, be particularly important.[35]

Particulate Matter

PM_{10} is small enough to reach the lower respiratory tract and has been associated with a wide range of serious health effects. PM_{10} is a heterogeneous

mixture of small solid or liquid particles of varying composition found in the atmosphere. Fine particles ($PM_{2.5}$) are emitted from combustion processes (especially diesel-powered engines, power generation, and wood burning) and from some industrial activities. Coarse particles (diameter between 2.5 and 10 μm) include windblown dust from dirt roads or soil and dust particles created by crushing and grinding operations. Toxicity of particles may vary with composition.[37,38]

Particle pollution contributes to excess mortality and hospitalizations for cardiac and respiratory tract disease.[14,39–41] The mechanism for particulate matter–associated cardiac effects may be related to disturbances in the cardiac autonomic nervous system, cardiac arrhythmias, or increased blood concentrations of markers of cardiovascular risk (eg, fibrinogen).[16,42]

Daily changes in mortality rates and numbers of people hospitalized are linked to changes in particulate air pollution.[14,39–41] These studies and others have estimated that for every 10 $\mu g/m^3$ increase in PM_{10}, there is an increase in the daily mortality rate between 0.5% and 1.6%. Effects were seen even in cities with mean annual PM_{10} concentrations between 25 and 35 $\mu g/m^3$. These recent studies suggest that even the current federal standards for $PM_{2.5}$ (24-hour standard = 65 $\mu g/m^3$; annual standard = 15 $\mu g/m^3$) and PM_{10} (24-hour standard = 150 $\mu g/m^3$; annual standard = 50 $\mu g/m^3$) should be lowered to protect public health. In 2002, California adopted more stringent standards for particulate matter: the annual average standard for $PM_{2.5}$ is 12 $\mu g/m^3$ and for PM_{10} is 20 $\mu g/m^3$.[43]

In children, particulate pollution affects lung function[44–46] and lung growth.[19] In a prospective cohort of children living in southern California, children with asthma living in communities with increased levels of air pollution (especially particulates, nitrogen dioxide, and acid vapor) were more likely to have bronchitis symptoms. In this study, bronchitis symptoms refers to a parental report of "one or more episodes of 'bronchitis' in the past 12 months" or report that, "apart from colds, the child usually seems to be congested in the chest or able to bring up phlegm").[47] The same mix of air pollutants was also associated with deficits in lung growth (as measured by lung function tests).[19] Recent studies in different countries have also found associations between ambient air pollution (especially particulates and/or carbon monoxide) and postneonatal infant mortality (attributable to respiratory causes and possibly sudden infant death syndrome),[48,49] low birth weight,[50–53] and preterm birth.[51,54–56]

The relative contribution of fine versus coarse particles to adverse health effects is being investigated. In studies of cities on the East Coast, fine particles seem to be important.[57] In other areas, coarse particles have a stronger or similar effect.[58] Several studies have found that fine particles from power plants and motor vehicles[59] or industrial sources[60] may be more closely associated with mortality.

Nitrogen Dioxide

Nitrogen dioxide is a gaseous pollutant produced by high-temperature combustion. The main outdoor sources of nitrogen dioxide include diesel and gasoline-powered engines and power plants. Levels of nitrogen dioxide around urban monitors have decreased over the past 20 years. Currently, all areas of the country meet the national air quality standard for nitrogen dioxide of 0.053 ppm (100 $\mu g/m^3$), measured as an annual arithmetic mean. However, national emissions (overall production) of nitrogen oxides have actually increased in the past 20 years because of an increase in nitrogen oxide emissions from diesel vehicles.[1] This increase is of concern, because nitrogen oxide emissions contribute to ground-level ozone (smog) and other environmental problems such as acid rain.[1]

Controlled-exposure studies of people with asthma have found that short-term exposures (30 minutes) to nitrogen dioxide at concentrations as low as 0.26 ppm can enhance the allergic response after subsequent challenge with allergens.[61,62] These findings are of concern, because some urban communities that are in compliance with the federal standards for nitrogen dioxide (annual average) may experience substantial short-term peak concentrations (1-hour average) that exceed 0.25 ppm. Confirmation of these studies is needed.

Epidemiologic studies have reported relationships between increased ambient nitrogen dioxide and risks of respiratory tract symptoms[63,64] and asthma exacerbations.[65] As noted previously, children with asthma living in communities with increased levels of air pollution (especially nitrogen dioxide, acid vapor, and particulates) were more likely to have bronchitis symptoms.[47] The same mix of air pollutants was also associated with deficits in lung growth (as measured by lung function tests).[19] These effects were increased in children who spent more time outdoors.

The epidemiologic studies of health effects associated with nitrogen dioxide should be interpreted with caution. Increased levels of ambient nitrogen dioxide may be a marker for exposure to traffic emissions or other combustion-related pollution. An independent role of nitrogen dioxide cannot be clearly established because of the high covariation between ambient nitrogen dioxide and other pollutants. Nonetheless, these studies illustrate that adverse respiratory tract effects are seen in urban areas where traffic is a dominant source of air pollution.

Traffic-Related Pollution

Motor vehicles pollute the air through tailpipe exhaust emissions and fuel evaporation, contributing to carbon monoxide, $PM_{2.5}$, nitrogen oxides, hydrocarbons, other hazardous air pollutants (HAPs), and ozone formation. Motor vehicles represent the principal source of air pollution in many communities, and concentrations of traffic pollutants are greater near major roads.[66] Recently, investigators (primarily in Europe and Japan) have found increased adverse health effects among those living near busy roads.

Studies examining associations between adverse respiratory tract health and traffic have been reviewed.[67] Increased respiratory tract complications in children (eg, wheezing, chronic productive cough, and asthma hospitalizations) have been associated with residence near areas of high traffic density (particularly truck traffic).[68–71] Other investigators have linked various childhood cancers to proximity to traffic.[72–74]

Diesel exhaust, a major source of fine particulates in urban areas, is carcinogenic. Numerous studies have found an association between occupational exposure to diesel exhaust and lung cancer.[75] On the basis of extensive toxicologic and epidemiologic evidence, national and international health authorities, including the EPA and the International Agency for Research on Cancer, have concluded that there is considerable evidence of an association between exposure to diesel exhaust and an increased risk of lung cancer.[76,77] Additionally, fine particles in diesel exhaust may enhance allergic and inflammatory responses to antigen challenge and may facilitate development of new allergies.[78,79] Thus, diesel exhaust exposure may worsen symptoms in those with allergic rhinitis or asthma.

School buses operate in proximity to children, and most of the nation's school bus fleets run on diesel fuel. The EPA and some state agencies are establishing programs to eliminate unnecessary school bus idling and to promote use of cleaner buses to decrease children's exposures to diesel exhaust and the amount of air pollution created by diesel school buses (www.epa.gov/cleanschoolbus). A recent pilot study found that a child riding inside a school bus may be exposed to as much as 4 times the level of diesel exhaust as someone riding in a car.[80] These findings underscore the importance of advocating for school districts to replace diesel buses or retrofit them with pollution-reducing devices and limit school bus idling where children congregate as soon as possible.

Other Air Pollutants

Airborne levels of lead, sulfur dioxide, and carbon monoxide have decreased dramatically because of the implementation of control measures. However, levels of these pollutants may still be high near major sources. For example, high lead levels may be found near metals-processing industries, high sulfur dioxide levels may occur near large industrial facilities (especially coal-fired power plants), and high levels of carbon monoxide may occur in areas with heavy traffic congestion.[1]

In addition to criteria air pollutants, there are numerous other air pollutants produced by motor vehicles, industrial facilities, residential wood combustion, agricultural burning, and other sources that are hazardous to children. More than 50000 chemicals are used commercially, and many are released into the air. For most of these chemicals, data on toxicity are sparse.[81] Some pollutants remain airborne or react in the atmosphere to produce other harmful substances. Other air pollutants deposit into and contaminate land and water. Some toxic air pollutants such as lead, mercury, and dioxins degrade slowly or not at all. These pollutants may bioaccumulate in animals at the top of the food chain, including humans. Children can be exposed to toxic air pollutants through contaminated air, water, soil, and food.[3] One example of a persistent pollutant emitted into ambient air that leads to exposure through another route is mercury, a developmental neurotoxicant.[82] Industrial emissions, especially from coal-fired power plants, are the leading source of environmental mercury. Although the levels of airborne mercury may not be hazardous, mercury deposits into soil and surface waters and ultimately accumulates in fish.[82]

The HAPs, often referred to as "toxic air contaminants" or "air toxics," refer to 188 pollutants and chemical groups known or suspected to cause serious health effects including cancer, birth defects, and respiratory tract and neurologic illness.[3,83] The Clean Air Act directs the EPA to regulate HAPs, which include compounds such as polycyclic aromatic hydrocarbons, acrolein, and benzene from fuel or fuel combustion; solvents such as hexane and toluene; hexavalent chromium from chrome-plating facilities; perchloroethylene from dry-cleaning plants; asbestos; metals (eg, mercury and cadmium); and persistent organic pollutants such as polychlorinated biphenyls. In 2001, diesel exhaust was listed as a mobile-source HAP. Many of these compounds are included in a priority list of 33 HAPs that are of special concern because of their widespread use and potential carcinogenicity and teratogenicity.[81] The priority list and general sources of these compounds are available on the EPA Web site (www.epa.gov/ttn/atw/nata).

Limited monitoring data suggest that concentrations of some HAPs may exceed the goals of the Clean Air Act in many cities.[84] Mobile sources (on- and off-road vehicles) account for approximately half of the emissions[3] but may contribute to 90% of the cancer risk (www.scorecard.org/env-releases/hap/us.tcl). A number of studies assessing health risks have found that estimated levels of some of the HAPs are a potential public health problem in many parts of the United States.[3,84–86] For example, estimated concentrations of benzene, formaldehyde, and 1,3-butadiene may contribute to extra cases of cancer (at least 1 extra case per million population exposed) in more than 90% of the census tracts in the contiguous United States. Additionally, the most recent national cancer-risk assessment for HAPs (1996 data) did not include diesel exhaust in the risk estimates.[3] The health risks may also be underestimated, because there is limited information on toxicity values for many of the HAPs,[87] and the risk models did not consider the potential for increased risk in children. These findings underscore the need for better ways to decrease toxic air emissions and assess exposures and risks.

Air-pollution episodes created by disasters (eg, accidents, volcanoes, forest fires, and acts of terrorism) can also create hazards for children. A discussion of these events and of bioaerosols in ambient air (eg, fungal spores and pollen) is beyond the scope of this

policy statement. Additionally, this statement does not address the hazards of indoor air pollution.

PREVENTION

Public health interventions to improve air quality can improve health at the population level. A decrease in levels of air pollution in former East Germany after reunification was associated with a decrease in parent-reported bronchitis[88] and improved lung function.[89] During the 1996 Summer Olympics in Atlanta, Georgia, extensive programs were implemented to improve mass transportation and decrease anticipated downtown traffic congestion. These programs were successful and were associated with a prolonged decrease in ozone pollution and significantly lower rates of childhood asthma visits during this period.[90] Closure of a steel mill in Utah Valley and resultant reductions in particulate matter were associated with a twofold decrease in hospitalizations for asthma in preschool children.[91,92] Finally, lung function improved in children who moved away from communities with high particulate air pollution, compared with those who remained or moved to communities with comparable particulate air pollution.[93] These studies provide support for continued efforts to decrease air pollution and improve health via decreases in motor vehicle traffic and industrial emissions. Dietary factors may play a role in modulating the effects of air pollution in children. A recent study in Mexico City, Mexico, found that children with asthma given antioxidant supplements were less affected by ozone compared with a control group that did not receive supplementation.[94] Additional studies are needed to explore this issue further.

Air Pollution and the Regulatory Process

The Clean Air Act of 1970 mandated the EPA to establish the National Ambient Air Quality Standards (Table 1). Standards were set for criteria air pollutants because they are common, widespread, and known to be harmful to public health and the environment.[11,12,83,95] The standards are reviewed every 5 years and set to protect public health, including the health of "sensitive" populations such as people with asthma, children, and the elderly. These standards are set without considering the costs of attaining these levels.

The standards for ozone and particulate matter were revised in 1997 on the basis of numerous scientific studies showing that the previous standards were not adequate to ensure health protection. Legal challenges were made by the American Trucking Associations, the US Chamber of Commerce, and other state and local business groups. However, the Supreme Court ultimately supported the EPA and ordered implementation of the standards.[2] Establishing implementation plans will be a lengthy process that will require the coordinated efforts of the EPA, state and local governments, and industry and environmental organizations.

Population exposures to toxic air contaminants may be of substantial public health concern.[84,86] In contrast to criteria pollutants, monitoring of toxic air contaminants is more limited. Exposures are estimated on the basis of reported emissions and may underestimate actual exposures.[87] The EPA is mandated to develop regulations through a lengthy process that first sets standards to control emissions on the basis of best-available technology. After maximum available control technology emission standards are established, the EPA must assess the risk remaining after emission decreases for the source take effect (residual risk).

To date, the EPA has focused primarily on establishing technology-based emission standards,[3] and this has been a slow process for some sources (eg, mobile toxic air contaminants and mercury emissions). Nationwide, emissions of toxic air contaminants have dropped approximately 24% from baseline (1990–1993) because of regulation and voluntary decreases by industry. With the current plans for gradual fleet turnover and implementation of controls for motor vehicles and fuels, the EPA projects that toxic air-contaminant emissions from gasoline-powered and diesel mobile sources will not be decreased to 75% and 90% of baseline (1990–1993) levels, respectively, until the year 2020.[3] However, major decreases could be more rapidly achieved simply from a prompt, wider application of existing technology.

Protecting populations from exposure to the harmful effects of air pollutants will require effective control measures. Industry (eg, coal-burning power plants, refineries, and chemical plants) and motor vehicles (both gasoline- and diesel-powered) are major sources of criteria pollutants and HAPs.[11,12] For example, coal-fired power plants are important sources of nitrogen oxides (precursors of ozone), particulates, and sulfur dioxide and are the largest sources of mercury emission in the United States. Smaller sources such as dry cleaners, auto body shops, and wood-burning fireplaces can also affect air quality locally. Municipal and hospital waste incinerators release toxic air pollutants including mercury, lead, cadmium, and dioxin emissions. Depending on weather conditions and individual physicochemical properties, some pollutants can be carried by air currents to areas many miles from the source.

In numerous cities in the United States, the personal automobile is the single greatest polluter, because emissions from millions of vehicles on the road add up. Despite significant technologic advances that have led to tighter pollution control from vehicles, emissions vary substantially between vehicles, particularly between classes of vehicles, because of differences in fuel-economy standards set by regulatory agencies. For instance, the corporate average fuel-economy standards have less stringent fuel-economy requirements (average: 20.7 miles per gallon) for light-duty trucks, sport utility vehicles, and minivans, compared with passenger cars (average: 27.5 miles per gallon). The former group of vehicles tends to have higher emissions of air pollutants, higher fuel consumption, and higher emissions of greenhouse gases.[96,97] Information on emissions and fuel-economy ratings for recent models and a

guide for choosing clean, fuel-efficient vehicles are available from the EPA Web site (www.epa.gov/greenvehicles/index.htm). The high levels of particulate emissions from diesel-powered buses and trucks must also be addressed. More than 70% of fine particle emissions from traffic are attributable to diesel-powered buses and trucks.

Driving a private car is probably a typical citizen's most "polluting" daily activity, yet in many cases, individuals have few alternative forms of transportation. Thus, urban planning and smart growth are imperative. Urban sprawl affects land use, transportation, and social and economic development and ultimately has important implications for public health.[98] Ways in which individuals can help to decrease air pollution are available at www.epa.gov/air/actions and www.arb.ca.gov/html/brochure/50things.htm.

Air Quality Index

The air quality index (AQI) provides local information on air quality and potential health concerns at the observed (or forecasted) levels of air pollution and can be a useful tool for educating families about local air quality and health.[99] The AQI is reported daily in metropolitan areas, often as part of local weather forecasts on television or radio or in newspapers. The AQI divides air-pollution levels into 6 categories of risk for 5 common pollutants (ozone, PM_{10}, nitrogen dioxide, carbon monoxide, and sulfur dioxide). Each category has a descriptive name reflecting levels of health concern (ranging from good through very hazardous), an associated color, and an advisory statement. Information about air quality in a specific area can be obtained from www.epa.gov/air/urbanair/index.html, www.scorecard.org, or www.weather.com. Although many states and local air districts actively forecast and disseminate health warnings, the challenge is to have people take actions to protect themselves and decrease activities that cause air pollution.

Pediatric Environmental Health[100] from the AAP provides additional information about the outdoor air pollutants and the use of the AQI.

CONCLUSIONS

Ambient air pollution has important and diverse health effects, and infants and children are among the most susceptible. Currently, levels of ozone and particulates remain unhealthful in many parts of the United States, and the current National Ambient Air Quality Standards may not protect the public adequately. There is a compelling need to move forward on efforts to ensure clean air for all.

The assurance of healthy air for children to breathe is beyond the control of an individual pediatrician, and there are no easy solutions. State chapters of the AAP, as well as individual members, can play an important role as advocates for children's environmental health. Areas of involvement might include working with community coalitions in support of strong pollution-control measures and informing local and national representatives and policy makers about the harmful effects of the environment on children's health. Advocates for children's health are needed in discussions about land use and transportation issues. Pediatricians can also advocate for energy-saving (and pollution-minimizing) lifestyles to their patients' families, especially regarding vehicles driven.

In communities with poor air quality, pediatricians can play a role in educating children with asthma or other chronic respiratory tract disease and their families about the harmful effects of air pollution. Patients and families can be counseled on following the AQI to determine when local air-pollution levels pose a health concern. Ozone levels tend to be highest in the afternoon, and it may be possible to decrease children's exposure by scheduling strenuous outdoor activity earlier in the day.

As pediatricians become better informed about local air quality issues in their communities (eg, ozone, nearby industrial facilities, traffic, diesel buses, wood burning, etc), these local concerns can provide a starting point for discussion and education.

Pediatricians who serve as physicians for schools or for team sports should be aware of the health implications of pollution alerts to provide appropriate guidance to school and sports officials, particularly in communities with high levels of ozone.

RECOMMENDATIONS

1. The National Ambient Air Quality Standards are designed to protect the public. To achieve this, the following points should be addressed:
   - The revised standards for ozone and particulate matter adopted by the EPA in 1997 should be promptly implemented.
   - During implementation, the standards should not be weakened in any way that decreases the protection of children's health.
   - Because recent studies suggest that current standards for PM_{10}, $PM_{2.5}$, ozone, and nitrogen dioxide may not be protecting children, the standards should be promptly reviewed and revised.
   - Because the law requires that the most vulnerable groups be protected when setting or revising the air quality standards, the potential effects of air pollution on the fetus, infant, and child should be evaluated, and all standards should include a margin of safety for protection of children.
2. The current measures to protect children from exposures to HAPs are not effective and should be critically reevaluated. The EPA should focus on prompt implementation of the Clean Air Act Amendments of 1990 (Pub L No. 101–549) to decrease HAPs. Additional monitoring for HAPs should be undertaken to allow more accurate characterization of children's exposures to these compounds. Risk assessments for HAPs should be reviewed to ensure that goals are protective of children. Control measures that specifically protect children's health should be implemented.
3. States and local air districts with air quality concerns should actively implement forecasting and

dissemination of health warnings in ways that help people take actions to protect themselves and decrease activities that cause air pollution.

4. Children's exposure to diesel exhaust particles should be decreased. Idling of diesel vehicles in places where children live and congregate should be minimized. Ongoing programs to fund conversion of diesel school bus fleets to cleaner alternative fuels and technologies should be pursued.
5. Industrial emissions of mercury should be decreased.
6. Federal and state governments' policies should encourage reductions in mobile and stationary sources of air pollution, including increased support for mass transit, carpooling, retiring or retrofitting old power plants that do not meet current pollution-control standards, and programs that support marked improvements in fuel emissions of gasoline- and diesel-powered vehicles. Additionally, the development of alternative fuel fleets, low-sulfur diesel, and other "low-emission" strategies (eg, retrofit of existing diesel engines) should be promoted. Before promoting new alternative fuels, these alternative fuel sources should be critically evaluated and determined by governmental authorities to have a good safety profile.
7. The same overall fuel-economy standard should apply to all passenger vehicles. Programs that allow certain passenger vehicles to be exempt from the usual fuel-economy standards should be abolished.
8. City and land-use planning should encourage the design and redevelopment of communities to promote mass transit, carpooling, pedestrian walkways, and bicycle use.
9. Siting of school and child care facilities should include consideration of proximity to roads with heavy traffic and other sources of air pollution. New schools should be located to avoid "hot spots" of localized pollution.

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Environment and Public Works Committee Hearing
June 8, 2011
Follow-up Questions for Written Submission

Questions for Upson

Questions from:

Senator Barbara Boxer:

1. **Dr. Upson, your testimony references studies that examined the impacts of air pollution on children's health and found that breathing ozone levels during the school year, which are lower than during the summer, reduced lung function as pollution levels increased during the day.**

   Could you please provide some examples of how reduced lung function impacts children's health, and their ability to enjoy the normal types of activities that children do every day?

   Reduced lung function means that breathing in and out is harder—affecting both how much air you can inhale and how quickly you can blow it out. For children, this has important short-term and, potentially, long-term consequences. Healthy children playing in air pollution outdoors breathe more rapidly and more shallowly than they would in cleaner air, making it harder for them to participate in outdoor sports. However, growing evidence warns that breathing air pollutants in their childhood could have life-long impacts. For example, a 2004 study of children who lived in southern California found that those children who were exposed to pollution on a regular basis had their lung function reduced over time—that is, as they grew, their lungs didn't grow to function as well as the children who didn't breathe as much pollution. The impact of that is life long, because adolescents who have poorer lung development become adults who have lower lung function throughout their lives, putting them at increased risk for lung disease.[1]

2. **Dr. Upson, the Clean Air Act requires that the National Ambient Air Quality Standards be set at a level that protects public health, while providing sources of dangerous air pollution with flexible methods to reduce their emissions. As a critical care physician, how important is it to have health protective clean air standards based on the best available science to help reduce emergency room visits by people, including children, who get sick as a result of dangerous levels of air pollution?**

   As a critical care physician, I know that preventing people from getting sick is the best form of health care. That's why the Clean Air Act and the National Ambient Air Quality Standards are so important. By setting a threshold of pollution that has an adequate margin for safety, the standards prevent harm by reducing pollution. The benefits for cleaning up ozone show exactly what this means. EPA estimates that if we can reduce ozone to levels that would meet a 60

[1] Gauderman WJ, et al. The Effect of Air Pollution on Lung Development from 10 to 18 Years of Age. *New England Journal of Medicine*, 2004; 351: 1057-1067.

parts per billion 8-hour standard, we could prevent significant harm each year. They calculated those benefits as these: preventing the premature deaths of as many as 12,000 people; preventing some 58,000 asthma attacks and 5,300 myocardial infarctions, and reducing the visits to hospitals and emergency rooms by 21,000 each year.[2]

But we must have the most updated information to be able to protect the public from air pollution. A good example is the ozone standard. Beginning in 2005, research showed powerful new evidence that ozone could shorten life—new information that wasn't available when the 1997 standards were set. Now research is mounting that will allow EPA to better protect the public because there is better understanding of how pollution affects the human body. To use an analogy, if your doctor ignored growing evidence that something was harmful because the evidence five years ago didn't show that it was harmful then, you'd be ready to switch doctors. As a nation, we can't allow critical protection for public health to fail to keep up with the science. That's what the bipartisan Congress knew in 1970 when they set this system in place for regular rigorous review of the science.

3. **Dr. Upson, your testimony discusses a wealth of scientific studies that have found harmful health impacts directly related to dangerous levels of air pollution. As a doctor, what would be lost if the federal government failed to use such science to protect public health from such pollution?**

Most importantly, lives would be lost—people would have their lives cut short who would otherwise have months to years longer to live. Earlier this year, EPA reported to Congress, as required, on the impact of the Clean Air Act on the nation's health. Their analysis found profound benefits through cleanup measures put in place because of this public health law. EPA estimated in 2010 alone that some 160,000 people did not lose their lives who would have died prematurely had the pollution not been cleaned up. But that's not the only benefit. EPA estimates that people in the U.S. did not have to suffer 1.7 million asthma attacks and 130,000 myocardial infarctions thanks to the cleanup of pollutants that trigger those attacks. Finally, the cleanup prevented some 86,000 admissions to the hospitals and emergency departments in 2010 as well. [3]

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[2] U.S. Environmental Protection Agency. Summary of the updated Regulatory Impact Analysis (RIA) for the Reconsideration of the 2008 Ozone National Ambient Air Quality Standard (NAAQS). 2009. Accessed at http://www.epa.gov/ttn/ecas/regdata/RIAs/s1-supplemental_analysis_summary11-5-09.pdf.

[3] U.S. Environmental Protection Agency. Benefits and Costs of the Clean Air Act, Second Prospective Study: 1990 to 2010. April 2011. Accessed at http://www.epa.gov/air/sect812/prospective2.html.

Senator Thomas R. Carper

1. **The American Lung Association has received grants from the U.S. Environmental Protection Agency. Can you describe these grants?**

   The American Lung Association has a long history of implementing educational programs along with other efforts to protect public health. Through the competitive process, the Lung Association has applied for and received grants from federal agencies, including the EPA, to enhance delivery of programs that combat lung disease. Funding from federal agencies is restricted to the purposes spelled out in each grant. Some of our local associations have received similar program delivery grants, as well as grants to implement diesel cleanup.

   The EPA fully discloses funding to all organizations in its grant database.

2. **Can you please discuss what the most recent data about asthma prevalence in the United States shows?**

   Approximately 24.6 million people in the United States, including 7.0 million children, had asthma in 2009—a rate of 81.5 per 1,000 people. Children and teens between 5 and 17 years of age had the highest prevalence rate (109.3 per 1,000 people). Overall, all children and teens under 18 had asthma at a much higher rate (96.1 per 1,000) than those over 18 (76.8 per 1,000).[4]

   The burden of asthma has increased significantly since 2000 when 20.3 million people in the U.S. had the disease, including 6.3 million children. The prevalence rate in 2000 was much lower, as well, standing at 73.4 per 1,000 people.[5]

   The burden also falls more heavily on some groups in our society. In 2009, the current asthma prevalence rate was 43 percent higher in blacks than in whites (111.5 per 1,000 persons versus 78.1 per 1,000 persons, respectively).[6] Hispanics of Puerto Rican heritage are hit especially hard by asthma, being more than twice as likely as non-Hispanic whites to be diagnosed with the disease (16.6 vs. 8.2 percent).[7]

3. **Are respiratory illnesses, like asthma, usually long-term? Will a child with asthma usually have asthma for life?**

   Respiratory illnesses include a wide array of complex diseases ranging from the acute to chronic. Because breathing is essential to life, respiratory diseases, both acute and chronic, can place life

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[4] American Lung Association. Trends in Asthma Morbidity and Mortality. July 2011. Available at http://www.lungusa.org/finding-cures/our-research/trend-reports/asthma-trend-report.pdf.
[5] American Lung Association, 2011.
[6] American Lung Association, 2011.
[7] Akinbami LJ, Moorman JE, Liu X. Asthma Prevalence, Health Care Use, and Mortality: United States, 2005-2009. *National Health Statistics Report*. 2011; 32:1-32.

at risk. Acute diseases like influenza can have limited durations. Chronic diseases, such as asthma, can start at various points in a person's life and can continue throughout his or her life. Although medical research continues to seek cures for chronic lung diseases, we have not been successful to date. Despite improvements in diagnosis and treatment, these diseases often remain throughout a person's entire life.

Asthma is one of the most common lung diseases in children. It can begin in infancy but is difficult to accurately diagnose before the age of six years, when children are able to properly perform breathing tests (pulmonary function tests), and because there are other conditions, such as infection with respiratory syncytial virus, that mimic asthma. If a child is correctly diagnosed with asthma, it is for life.[89] Some children appear to have a remission of their asthma symptoms in adolescence. However, children who are diagnosed as having asthma with persistent wheezing can have their airways altered in ways that cause loss of lung function that continues throughout their adult lives.[10] Some children develop asthma in adolescence. Asthma is much more prevalent in boys before puberty than among girls, but then becomes more prevalent in females.[11]Adults can also develop asthma [12] and those who have asthma at age 30 or 40 likely had reduced lung function at age 10. [13]

4. Where are the major sources for the air pollution that impacts children's health today?

Air pollution that impacts children's health comes many sources, especially from the combustion of fuels, including coal, gasoline, oil and diesel fuel and the reaction of gases in the atmosphere. Air pollution also comes from the evaporation of fuels and chemicals, and mechanical processes, like dust storms, construction and demolition, mining operations and agriculture.

Ozone is formed by chemical reactions in the atmosphere from two categories of gases, nitrogen oxides (NO_x) and volatile organic compounds (VOCs). Those gases are produced primarily when fossil fuels like gasoline, oil or coal are burned or when some chemicals, like solvents, evaporate. NO_x is emitted from power plants, motor vehicles and other sources of high-heat combustion. VOCs are emitted from motor vehicles, chemical plants, refineries, factories, gas stations, paint and other sources. Both NOx and VOCs are harmful by themselves as well.

Particle pollution is produced through two separate processes—mechanical and chemical. Mechanical processes break down solid materials with the material remaining essentially the

[8] Reed CE. The Natural History of Asthma. *Journal of Allergy and Clinical Immunology*. 2006. 118: 543-548.
[9] Gelfand EW. Pediatric Asthma: A Different Disease. *Proceeds of the American Thoracic Society*, 2009. 6:276-282.
[10] Gelfand, 2009.
[11] Postma DS. Gender Differences in Asthma Development and Progression. *Gender Medicine*. 2007. 4 (Supplement 2): S133-S146.
[12] Reed, 2006.
[13] Glefand, 2009.

same, only becoming smaller. Mechanical processes primarily create coarse particles.[14] Tire, brake pad and road wear can also create coarse particles. Bacteria, pollen, mold, and plant and animal debris are also included as coarse particles. [15]

By contrast, chemical processes in the atmosphere create most of the tiniest fine and ultrafine particles. Combustion sources burn fuels and emit gases. These gases can vaporize and then condense to become a particle of the same chemical compound. Or, they can react with other gases or particles in the atmosphere to form a particle of a different chemical compound. Particles formed by this latter process come from the reaction of elemental carbon (soot), heavy metals, sulfur dioxide (SO_2), nitrogen oxides (NO_x) and volatile organic compounds with water and other compounds in the atmosphere.[16] Burning fossil fuels in factories, power plants, steel mills, smelters, diesel- and gasoline-powered motor vehicles (cars and trucks) and equipment generate a large part of the raw materials for fine particles. So does burning wood in residential fireplaces and wood stoves or burning agricultural fields or forests.

[14] U.S. EPA. *Integrated Science Assessment for Particulate Matter*. U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-08/139F, 2009. Available at http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=216546#Download.
[15] U.S. EPA. *Integrated Science Assessment*, 2009.
[16] U.S. EPA. *Integrated Science Assessment*, 2009.

Senator David Vitter

1. **Dr. Upson, congratulations. Albuquerque enjoys some of the best air in the country and is in compliance with all National Ambient Air Quality Standards. The past 3 year average for ozone and PM were well within the range that EPA's science advisors are saying is safe. Hopefully you're not seeing any asthma aggravated by ozone or PM.**
    - **Dr. Upson, you currently serve as a Board Member of the American Lung Association of New Mexico. Is that correct?**

      I serve on the American Lung Association in New Mexico local board.

   Looking at the ALA New Mexico website, it says that doctors are not sure how a person gets asthma.

    - **Do you agree that the cause of asthma is unknown?**

      Asthma is a complex disease, with many unknown aspects, including the full understanding of the causes of asthma. The best indication is that asthma comes from a combination of genetics, allergies, environmental exposures and respiratory infections, but the specific combinations of genes and triggers that cause the disease are still unknown. However, we do know that the air pollutants that I discussed in my testimony are among the causes of asthma exacerbations.

    - **Can you explain why asthma rates have been going up while pollution rates have been going down dramatically?**

      The increase in asthma rates is an area of ongoing research, but there is still no clear concensus to explain why so many more people have asthma. Though we do not fully know why prevalence has increased, one aspect is obvious: the increase in asthma prevalence means that there are many more people who are at risk for asthma attacks from air pollution.

2. **Dr. Upson, EPA estimates that exposure to ozone is responsible for hundreds of thousands of hospital admissions and emergency department visits.**

    - **Are you familiar with the studies that EPA uses to support these conclusions?**

      Over 1,700 studies were included in the review of research that concluded with the adoption of the standard in 2008 that is being reconsidered by EPA now. I have reviewed the conclusions reached by the in-depth review by the Clean Air Scientific Advisory Committee—the independent scientific experts who assisted EPA in that review. That Committee reviewed the evidence both in 2007 and again in 2011, with the same conclusion: that the current standard failed to protect public health as required. I agree with their conclusion.

   Dr. Upson, eight new studies have been conducted over the past few years looking at the relationship between ozone and cardiovascular illness. These studies were conducted by researchers at institutions such as the Harvard School of Public Health, Emory University, and the University of Toronto. They were sponsored by organizations such as Health Canada, Health Effects Institute and the U.S. EPA.

Seven of the eight provided no evidence that current levels of ozone cause cardiovascular hospital admissions or ER visits. Four of these studies report no association between current ozone levels and cardiovascular morbidity (Szyskowicz 2008, Symons et al. 2006; Villeneuve et al. 2006; and Wellenius et al. 2005), while two other new studies report no relationship between ozone and combined respiratory and cardiovascular hospital admissions and ED visits (Tolbert et al. 2007; Zanobetti and Schwartz 2006; Tolbert, 2007). In the HEI study, the authors concluded "ozone exposures appeared to have no effect on admissions for cardiovascular disease."

- **Dr. Upson, are you familiar with these studies?**

  These studies are some of the on-going investigations into effects of ozone pollution on cardiovascular endpoints, an area of investigation that has grown in the past ten years, and relatively new compared to the vast evidence showing harm to respiratory health. The growth in such evidence is a key example why it is critical that the EPA regularly review new studies to ensure that the national air quality standards are set where they protect public health with a margin of safety.

- **How do these study results square with your own observations in your medical practice?**

  I regularly see patients every day who face higher risk from air pollution because of their health, their age or their socio-economic status. My patients are older and have chronic respiratory, cardiovascular or other diseases, or have low incomes, which would place them at risk from breathing ozone and particulate matter pollution.

3. **Dr. Upson, I understand you are a member of the American Thoracic Society. A Greenwire media report of a new EPA sponsored study by Kim et al. indicated that "lung damage from smog (or ozone) could be worse than previously thought." This study exposed subjects to 60 parts per billion of either ozone or filtered air for 6.6 hours while undergoing strenuous exercise intended to simulate a day of heavy to severe labor by outdoor workers. The average change in lung function reported by in the study was a reduction of 1.7% in lung capacity as measured by "Forced Expiratory Volume at 1 second" (FEV1). In this study, there were no significant changes in other symptoms observed.**

   - **Dr. Upson, it is my understanding that the American Thoracic Society does not consider such small changes in lung function alone to be adverse unless there are also symptoms. Is that correct?**

     The most recent official statement of the ATS, "What Constitutes an Adverse Health Effect of Air Pollution?" was published in 1999. Among the long list of defined adverse effects, changes in FEV_1 or FVC with symptoms, are considered adverse effects.

   Dr. Upson, in your medical opinion, do you consider a 1.7% temporary decrease in lung function after exercising for 6.6 hours while breathing 60 ppb ozone to be significant?

   I agree with the conclusion of the researchers who found that the effects were a significant decrement in FEV_1 and an increase in neutrophilic inflammation in the airways, two

independent markers of harmful impact on airway health. In particular, the inflammation response warns that chronic exposure to ozone, such as happens in many cities, may damage airways even in healthy adults. Chronic increase in neutrophilic inflammation has been strongly associated with worsening of asthma in people with that disease, and may cause airway damage, bronchoconstriction and bronchial hyperresponsiveness. For people with asthma, the impacts of exposure to ozone at 60 ppb would likely be more severe.

- **Also, among the people tested, a third showed an improvement in lung function breathing 60 ppb ozone, with one individual showing a greater than 10% improvement. About half of the individuals exposed to filtered air and exercise alone (without ozone) experienced a 1-5% decrease, one individual showing and approximate 18% decrease in lung function. Dr. Upson, in your medical opinion, what are the results of this study really saying?**

  This study shows that levels of ozone well below the current ozone standard caused harm to the airways of healthy adults. Even at an ozone level of 60 ppb--well below the current standard—there was a decline in lung function and increased airway inflammation during exercise. This study examined more than twice as many people as previous studies have examined. This finding tells us that it is time to re-evaluate the evidence and reduce emissions to levels that will have no adverse effect upon human health.

- **Do you feel you can really draw conclusions from such a mix of results?**

  I disagree with your characterization that the results are mixed. The results strongly meet the requirements for significance. In addition, since the tests were performed on healthy adults, others who are recognized as facing greater risk from ozone, such as my patients, children, and people with asthma or other chronic lung diseases likely would demonstrate greater harm.

Senator CARPER. You were precisely at 5 minutes.
[Laughter.]
Senator CARPER. Dr. Ginda, do you feel up to it?

STATEMENT OF JAMES E. GINDA, MA., RRT, AE-C, CHES, SUPERVISOR OF RESPIRATORY CARE, KENT HOSPITAL

Mr. GINDA. I will give it my best.
Senator CARPER. Give it a shot. Welcome. You have 5 minutes.
Mr. GINDA. Good morning. My name is James Ginda. I am honored to have this opportunity to be here today to testify before you on this important topic. It is an opportunity for me to advocate for those who do not have a voice, but who are affected by air quality issues.

The topic of air pollution and children's health is one that means a great deal to me. I am a registered respiratory therapist, a certified asthma educator and a certified health education specialist and have been in the field for 33 years. I have seen first-hand the impact of lung disease on the lives of patients I have cared for in hospital settings and in home care.

While educating children through the years about lifestyle choices, such as cigarette somking, I have come to realized the effects of environment on the lung health, and felt the need to try to make a difference on a more macro level, upstream and health promotion.

Environment is something that is too often beyond their individual control, whether it be secondhand smoke, housing conditions, or outdoor air quality, which I will focus on today. Beyond counseling them to remain indoors on the worst air quality days, they are susceptible to environmental triggers when outdoor air pollution makes its way indoors, particularly for those in urban communities where air conditioning is not an option and their vulnerability is compounded by other co-morbid conditions and socioeconomic factors.

Airborne toxins are problematic because of the gaseous components, acid aerosols, byproducts of photochemical reactions, such as ground level ozone, and the effects of inhaled particulate matter deposited within the lungs. Particulate matter is composed of black carbon soot, metals, volatile organic compounds and crustal materials from mobile and stationery sources, such as diesel engines and power plants.

The lungs act as a highly efficient filter and trap inhaled particles within their structures. Black carbon fine particulates get past upper airway lung defenses, even in healthy individuals, and carry toxins deep into the lungs, including carcinogens. The black carbon in particulate matter has been show to be a formidable opponent for alveolar macrophages, which are important for infection protection and a last line of lung defense. Chronic inflammation which is uncontrolled can lead to airway remodeling and a fixed degree of airflow obstruction, as we see in chronic lung disease.

Both the fine particle and gaseous components of air pollution are triggers in asthma and can affect children even at low levels, below the National Ambient Air Quality Standards. Weather events, such as air temperature inversions, can trap pollutants and compound this problem. Gaseous components, such as sulfur and

nitrogen oxides, and acid aerosols, are irritating to airways and can induce an inflammatory response in the lungs and construction of bronchial smooth muscle, which narrows the airways and makes breathing difficult.

Asthma is the most common chronic disease of childhood, and is responsible for a large amount of health care expenditures and lost school days. The burden extends to families who lose work days caring for sick children and to the health care system with increased acute care visits, emergency department visits and hospitalizations. Crisis-centered medical care and asthma education are not enough to preserve or improve the health of asthmatic children when environmental triggers are out of the control of the most vulnerable. Indeed, the Healthy People goals for improving the health of our Nation recognize this in their comprehensive respiratory disease and Environmental objectives.

In 2010, after 3 years of careful study and consideration, the Rhode Island General Assembly passed a comprehensive clean construction bill as part of the Diesel Emissions Reduction Act, known as An Act Concerning Government Responsibility to Protect Public Health from Diesel Pollution, it is a shining example of a cooperative effort between concerned legislators, State agencies, environmental groups, industry representatives and health advocates.

Local action has also been taken by city councils to reduce diesel emissions in the form of enforcement of anti-idling ordinances and pollution control devices on their city fleets. This cooperation momentum to address controllable sources of pollution must continue nationwide to improve the health of our communities. Air pollution is not confined with local or State borders. And children upwind can be affected by pollution from distant sources. So we also rely heavily on the United States Environmental Protection Agency and Federal Clean Air Act to protect our children.

Children, and particularly children with asthma, are considered more vulnerable to air pollution with their higher respiratory rates, lung ventilation and outdoor activity and play. Prevention has to be a focus in health care and reducing the health burden of these toxins is within our grasp. On my own behalf as well as on behalf of the patients and families for whom I advocate today, who I have had the honor and privilege of caring for through the years, I applaud you for holding this hearing and urge your support of regulations and legislation aimed at continuing to reduce this preventable health threat.

Children are the future of our Nation, healthy children in safe and healthy communities. The yellow cautions for children playing can serve as a reminder of all childhood health threats. Creating a healthier environment by controlling air toxins from mobile and stationary sources will benefit not only those most at risk, but indeed, all of us who depend on breathing clean air for optimal health.

Thank you.

[The prepared statement of Mr. Ginda follows:]

United States Senate Hearing on Air Quality and Children's Health

Testimony of James E. Ginda, MA, RRT, AE-C, CHES

June 8, 2011

Washington, DC

Good morning! My name is James Ginda, and I am honored to have this opportunity to be here today to testify before you on this important topic. It is an opportunity for me to advocate for those who do not have a voice, but who are affected by air quality issues. The topic of air pollution and children's health is one that means a great deal to me. I am a Registered Respiratory Therapist, a Certified Asthma Educator, and a Certified Health Education Specialist, and have been in health care for more than 33 years. I have seen firsthand the impact of lung disease on the lives of patients I have cared for in both hospital settings and home care.

While educating children through the years about lifestyle choices such as cigarette smoking, I have come to realize the effects of environment on their lung health, and felt the need to try to make a difference upstream on a more macro level in health promotion. Environment is something that is too often beyond their individual control, whether it may be second-hand smoke, housing conditions, or outdoor air quality which I will focus on today. Beyond counseling them to remain indoors on the worst air quality days, they are susceptible to environmental triggers when outdoor air pollution makes its way indoors, and particularly for those in urban communities where air conditioning is not an option, and their vulnerability is compounded by other comorbid conditions and socio-economic factors.

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events such as air temperature inversions can trap pollutants and compound this problem. Gaseous components such as sulfur and nitrogen oxides and acid aerosols are irritating to airways and can induce an inflammatory response in the lungs, and constriction of bronchial smooth muscle which narrows the airways and makes breathing difficult.

Asthma is the most common chronic disease of childhood and is responsible for a large amount of health care expenditures and lost school days. The burden extends to families who lose work days caring for sick children, and to the health care system with increased acute care visits, emergency department visits, and hospitalizations. Crisis-centered medical care and asthma education are not enough to preserve or improve the health of asthmatic children when environmental triggers are out of the control of the most vulnerable. Indeed, the Healthy People goals for improving the health of our nation recognize this in their respiratory disease and environmental objectives.

In 2010 after three years of study and careful consideration, the Rhode Island General Assembly passed a comprehensive clean construction bill as part of the Diesel Emissions Reduction Act *(RIGL 31-47.3)*. Known as "An Act Concerning Government Responsibility to Protect Public Health From Diesel Pollution," it is a shining example of a cooperative effort between concerned legislators, state agencies, environmental groups, industry representatives, and health advocates. Local action has also been taken by city councils to reduce diesel emissions. This cooperation and momentum to address controllable sources of pollution must continue nationwide to improve the health of our communities. Air pollution is not confined within local or state borders and children upwind can be affected by pollution from distant sources, so we also rely on the United States Environmental Protection Agency and Federal Clean Air Act to protect our children.

Children, and particularly children with asthma, are considered more vulnerable to air pollution with their higher respiratory rates and lung ventilation. Prevention has to be a focus in health care, and reducing the health burden of these toxins is within our grasp. On my own behalf as well as on behalf of the patients and families for whom I advocate today, I applaud you for holding this hearing and urge your support of regulations and legislation aimed at continuing to reduce this preventable health threat.

Children are the future of our nation—healthy children in safe and healthy communities. The yellow caution signs for children playing can serve as a reminder of all childhood health threats. Creating a healthier environment by controlling air toxins from mobile and stationary sources will benefit not only those most at risk, but indeed all of us who depend on breathing clean air for optimal health.

Thank you!

Chronic Disease Manager

Diesel Fumes and the Respiratory Patient

by James E. Ginda, MA, RRT, AE-C

Lifestyle modifications are often necessary in chronic disease management. Respiratory patients are counseled to stop smoking and to recognize and avoid triggers. However, environment is a factor that is often beyond individual control. Beyond staying indoors or reducing outdoor activity on days with known poor air quality, individuals with respiratory diseases may have little control over pollutants in the air they breathe.

While particularly problematic for respiratory patients, air quality is important for everyone. HEPA filtration and respiratory protective equipment are mandated under circumstances where occupational exposure is likely. But what about when exposure to air pollution is likely with activities of daily living? Just like with clean water, the public health solution is not downstream with consumers, but upstream with protecting the public water supply. The public health solution to air pollution is not to issue everyone an N-95 mask, but to keep from putting toxins into the air to the greatest extent possible.

The U.S. Environmental Protection Agency has stated that "Reducing emissions from diesel engines is one of the most important air quality challenges facing the country." They point out that: "Even with more stringent heavy-duty highway engine standards set to take effect over the next decade, over the next 20 years, millions of diesel engines already in use will continue to emit large amounts of nitrogen oxides and particulate matter, both of which contribute to serious public health problems. These problems are manifested by thousands of instances of premature mortality, hundreds of thousands of asthma attacks, millions of lost work days, and numerous other health impacts."[1]

about the author...

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Toxicity of diesel emissions

The smell of diesel fumes and the characteristic black cloud of exhaust from older engines that have not been retrofitted with pollution control devices make one take notice of something bad in the air. Diesel exhaust consists of two major component groups. The first are the gaseous pollutants such as carbon monoxide, nitrogen oxides, sulfur dioxide, and ozone. The second group is the particulate matter, which forms a heterogeneous aerosol of small particles with an elemental carbon core and layers including nitrates, sulfates, metals, and toxics.

Diesel particles can be understood by respiratory therapists familiar with medical aerosol terminology and deposition. The particles in the 10 micron range (PM 10) are the larger particles that deposit primarily in the tracheo-bronchial tree. The fine particles in the 2.5 micron range (PM 2.5) deposit primarily in the small airways and alveoli. With diesel aerosols, there is another group to consider — the ultra-fine particles. These are less than 0.1 microns in diameter, or viral size, and make up a major portion of airborne particulate matter from diesel exhaust.

The level of exposure to airborne toxins, duration of exposure, and genetic variations in individual susceptibility all factor into the respiratory effects of air pollution. Exposure to airborne environmental toxins may result in short-term or long-term ill effects like bronchospasm, inflammation, cytokine release, an invoked allergic response or carcinogenesis. The black carbon in diesel particulate matter has been shown to be a formidable opponent for macrophages, which provide a last line of lung defense at the alveolar level. "More than half of U.S. black carbon emissions come from diesel

engines: 41% from on-road diesels and 16% from off-road diesels."[2]

The clinical and economic impact of diesel exhaust toxicity is substantial. In a review article titled "The Toxicity of Diesel Exhaust: Implications for Primary Care," Krivoshto et al note, "In 2006 the California Air Resources Board estimated that diesel exhaust pollution directly accounts for 2,400 deaths and, annually, nearly 3,000 hospital admissions for respiratory and cardiac-related diseases, at a total cost of $19 billion."[3]

Airway inflammation is a primary concern in asthmatics, and exposure to diesel exhaust particles can affect inflammatory mediator activity. Interleukin-8 (IL-8) is a pro-inflammatory chemokine, and exposure to diesel exhaust particles with varying organic content has been shown to differentially induce expression and promotion of IL-8 in human airway epithelial cells.[4] Another pro-inflammatory mediator is granulocyte macrophage colony stimulating factor (GM-CSF). Diesel exhaust particles stimulate production of GM-CSF along with IL-8 in airway epithelium.[5]

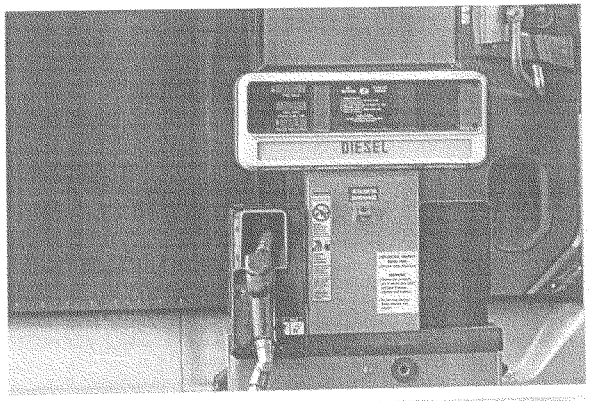
Asthma is one of the leading causes of school absenteeism, with an estimated 12.3 million school days missed in 2003.[6] In one study relating to asthma, O'Connor and Neas et al from the Boston University School of Medicine analyzed data from 861 children with persistent asthma in seven U.S. urban communities. They compared asthma symptom reporting, pulmonary function results, and aerometric pollution data. They found that higher levels of NO_2 and PM 2.5 were associated with asthma-related missed school days, and higher concentrations of NO_2 with increased asthma symptoms. It was interesting that almost all pollutant concentration levels were below the National Ambient Air Quality Standards.[7]

Exacerbation of COPD has been associated with short-term exposure to air pollution, and long-term exposure to traffic-related air pollution may contribute to the development of COPD.[8] In a recent cohort study of 52,799 eligible subjects, COPD incidence was associated with the 35-year mean NO_2 level, and susceptibility was possibly enhanced when there was diabetes or asthma as a comorbid condition.[9] Clearly a paradox exists for patients with respiratory diseases faced with the dilemma of trying to be active outdoors to the greatest extent possible when environmental factors beyond their control influence their lung function and health.

Nowhere to hide

What about leaving it all behind and escaping to the great outdoors for clean, fresh air? Maine is a state known for its outdoor recreational activities. It is home to Mount Kahtadin, the northernmost peak of the Appalachian Trail that runs from Maine to Georgia and home to Acadia National Park on the northeast coast. Over a 10-year period the best visibility was 87 miles and the worst was 16 miles. The reduction in visibility is a result of air pollution in the form of haze.[10] The haze on one of the worst days was composed of sulfates (73%), organic carbon particles (13%), nitrates (6%), elemental carbon (4%), and crustal materials (4%).[11]

In 2005, Maine had the second fastest growing rate of asthma in the nation, affecting 9.4% of the adult population and one out of eight children.[12] In a study of biologically soluble metal ions from particulate matter (PM 10) by researchers from the department of environmental science at the University of Southern Maine in Gorham, a key determination was that most of the PM 10 did not originate from local crustal material.[13] Even when envi-



ronmental aerosols are generated from transportation sources in the northeast corridor and power plants to the south, weather conditions like the location of the jet stream can impact where they end up; and they can still affect respiratory patients many miles away.

Reducing the burden

The diesel engine has been referred to as the economic workhorse of an industrialized society. The good thing about diesel engines is that they last a long time, with the average useful life being nearly 30 years. Unfortunately, that is also the bad thing about diesel engines. The air pollution levels of older technology are the downside of such a long, useful life.

Diesel engines release 10 times the amount of NO_2, aldehydes, and breathable PM compared to unleaded gasoline engines and more than 100 times that produced by catalysed gasoline engines.[14] Diesel retrofits, ultra-low sulfur fuels, and anti-idling ordinances can significantly reduce the level of toxins in the environment and make a difference to respiratory patients now. Respiratory patients do not have time to wait for 30-year replacement cycles.

Healthy People 2020, the latest public health blueprint for America, includes a goal to "reduce air toxic emissions to decrease the risk of adverse health effects caused by airborne toxics."[15] At a time when health care expenditures are at an all-time high and COPD was recently named by the Centers for Disease Control and Prevention as the third leading cause of death in the United States, funding for clean air health initiatives such as the Diesel Emissions Reduction Act pays long-term dividends in the health of the nation. For every $1 invested, an average of $13 is realized in health and economic benefits.[16] This makes it one of the most cost-effective federal programs, and one with bipartisan support.

Respiratory patients may have some control over certain environmental factors (e.g., avoiding secondhand smoke), but there are still others beyond their control (e.g., poor air quality) that may exacerbate breathing difficulties. Respiratory therapists can play an important role in advocating for air quality initiatives. Clean air is not a political issue but rather an important public health issue, particularly for those with chronic respiratory diseases.

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U.S. Senate Hearing on Air Quality and Children's Health

June 8, 2011

James E. Ginda, MA, RRT, AE-C, CHES

Testimony References

Lung radiology and pulmonary function of children chronically exposed to air pollution.

Calderón-Garcidueñas L, Mora-Tiscareño A, Fordham LA, Chung CJ, Valencia-Salazar G, Flores-Gómez S, Solt AC, Gomez-del Campo A, Jardón-Torres R, Henríquez-Roldán C, Hazucha MJ, Reed W.

"We analyzed the chest radiographs (CXRs) of 249 clinically healthy children, 230 from southwest Mexico City and 19 from Tlaxcala. In contrast to children from Tlaxcala, children from southwest Mexico City were chronically exposed to ozone levels exceeding the U.S. National Ambient Air Quality Standards for an average of 4.7 hr/day and to concentrations of particulate matter (PM) with aerodynamic diameters </= 2.5 microm (PM2.5) above the annual standard. CXRs of Mexico City children demonstrated bilateral hyperinflation (151 of 230) and increased linear markings (121 of 230). Hyperinflation and interstitial markings were significantly more common in Mexico City children ($p < 0.0002$ and 0.00006 respectively)... Computed tomography (CT) scans were obtained in 25 selected Mexico City children with abnormal CXRs. Mild bronchial wall thickening was seen in 10 of 25, prominent central airways in 4 of 25, air trapping in 8 of 21, and pulmonary nodules in 2 of 21. Only 7.8% of Mexico City children had abnormal lung function tests based on predicted values. These findings are consistent with bronchiolar, peribronchiolar, and/or alveolar duct inflammation, possibly caused by ozone, PM, and lipopolysaccharide exposure. The epidemiologic implications of these findings are important for children residing in polluted environments, because bronchiolar disease could lead to chronic pulmonary disease later in life."

(Environ Health Perspect. 2006 Sep;114(9):1432-7, Accessed 6/5/11)

Air pollution, aeroallergens, and emergency room visits for acute respiratory diseases and gastroenteric disorders among young children in six Italian cities.

Orazzo F, Nespoli L, Ito K, Tassinari D, Giardina D, Funis M, Cecchi A, Trapani C, Forgeschi G, Vignini M, Nosetti L, Pigna S, Zanobetti A.

"Air pollution is associated with triggering of wheezing and gastroenteric disorders in children 0-2 years of age; more work is needed to understand the mechanisms to help prevent wheezing in children."

(Environ Health Perspect. 2009 Nov;117(11):1780-5. Epub 2009 Aug 13, Accessed 6/5/11)

Short-term effects of PM10 and NO2 on respiratory health among children with asthma or asthma-like symptoms: a systematic review and meta-analysis.

Weinmayr G, Romeo E, De Sario M, Weiland SK, Forastiere F.

"We found clear evidence of effects of PM10 on the occurrence of asthma symptom episodes, and to a lesser extent on cough and PEF. The results for NO2 are more difficult to interpret because they depend on the lag times examined. There was an indication of effect modification by several study conditions."

(Environ Health Perspect. 2010 Apr;118(4):449-57. Epub 2009 Nov 12, Accessed 6/5/11)

Short-term health effects of particulate and photochemical air pollution in asthmatic children.

Just J, Ségala C, Sahraoui F, Priol G, Grimfeld A, Neukirch F.

"This study showed that, although within international air quality standards, the prevailing levels of photo-oxidant and particulate pollution in spring and early summer had measurable short-term effects on children with mild-to-moderate asthma."

(Eur Respir J. 2002 Oct;20(4):899-906., Accessed 6/5/11)

Effect of early life exposure to air pollution on development of childhood asthma.

Clark NA, Demers PA, Karr CJ, Koehoorn M, Lencar C, Tamburic L, Brauer M.

"A total of 3,482 children (9%) were classified as asthma cases. We observed a statistically significantly increased risk of asthma diagnosis with increased early life exposure to CO, NO, NO2, PM10, SO2, and black carbon and proximity to point sources. Traffic-related pollutants were associated with the highest risks: adjusted odds ratio = 1.08 (95% confidence interval, 1.041.12) for a 10-microg/m3 increase of NO, 1.12 (1.071.17) for a 10-microg/m3 increase in NO2, and 1.10 (1.061.13) for a 100-microg/m3 increase in CO. These data support the hypothesis that early childhood exposure to air pollutants plays a role in development of asthma."

(Environ Health Perspect. 2010 Feb;118(2):284-90.Accessed 6/5/11)

PM 10 exposure and asthma exacerbations in pediatric age: a meta-analysis of panel and time-series studies.

Romeo E, De Sario M, Forastiere F, Compagnucci P, Stafoggia M, Bergamaschi A, Perucci CA.

"Exposure to PM10 was associated with an increase in hospitalizations for asthma and, in asthmatic children, with the frequency of asthmatic symptoms (wheezing and cough), the use of anti-asthma

medications (in addition to regular therapy) and a decrease in lung functioning. Additional research is necessary to explain the causes of the heterogeneity in the estimates.

(Epidemiol Prev. 2006 Jul-Oct;30(4-5):245-54., Accessed 6/5/11)

Ambient air pollution and children's health: A systematic review of Canadian epidemiological studies.

Koranteng S, Vargas AR, Buka I.

"AP has detrimental health effects among Canadian children. Paediatricians and other health care workers with an interest in child health should encourage parents and children to adhere to smog (AP) advisories. Existing regulatory practices should be reviewed to reduce current levels of ambient air pollutants in Canada."

(Paediatr Child Health. 2007 Mar;12(3):225-33., Accessed 6/5/11)

The relationship of air pollution and surrogate markers of endothelial dysfunction in a population-based sample of children.

Poursafa P, Kelishadi R, Lahijanzadeh A, Modaresi M, Javanmard SH, Assari R, Amin MM, Moattar F, Amini A, Sadeghian B.

"The relationship of air pollutants with endothelial dysfunction and pro-coagulant state can be an important factor in the development of atherosclerosis from early life. This finding should be confirmed in future longitudinal studies. Concerns about the harmful effects of air pollution on children's health should be considered a top priority for public health policy; it should be underscored in primordial and primary prevention of chronic diseases."

(BMC Public Health. 2011 Feb 18;11:115, Accessed 6/5/11)

Ambient air pollution: health hazards to children.

Kim JJ; American Academy of Pediatrics Committee on Environmental Health.

"Ambient (outdoor) air pollution is now recognized as an important problem, both nationally and worldwide. Our scientific understanding of the spectrum of health effects of air pollution has increased, and numerous studies are finding important health effects from air pollution at levels once considered safe. Children and infants are among the most susceptible to many of the air pollutants. In addition to associations between air pollution and respiratory symptoms, asthma exacerbations, and asthma hospitalizations, recent studies have found links between air pollution and preterm birth, infant mortality, deficits in lung growth, and possibly, development of asthma. This policy statement summarizes the recent literature linking ambient air pollution to adverse health outcomes in children and includes a perspective on the current regulatory process. The statement provides advice to

pediatricians on how to integrate issues regarding air quality and health into patient education and children's environmental health advocacy and concludes with recommendations to the government on promotion of effective air-pollution policies to ensure protection of children's health."

(Pediatrics. 2004 Dec;114(6):1699-707, Accessed 6/5/11)

Air pollution and health: a European and North American approach (APHENA).

Katsouyanni K, Samet JM, Anderson HR, Atkinson R, Le Tertre A, Medina S, Samoli E, Touloumi G, Burnett RT, Krewski D, Ramsay T, Dominici F, Peng RD, Schwartz J, Zanobetti A; HEI Health Review Committee.

"APHENA has shown that mortality findings obtained with the new standardized analysis were generally comparable to those obtained in the earlier studies, and that they were relatively robust to the data analysis method used. For PM10, the effect-modification patterns observed were not entirely consistent between Europe and the United States. For O3, there was no indication of strong effect modification in any of the three data sets."

(Res Rep Health Eff Inst. 2009 Oct;(142):5-90, Accessed 6/5/11)

Acute effects of ambient particulate matter on mortality in Europe and North America: results from the APHENA study.

Samoli E, Peng R, Ramsay T, Pipikou M, Touloumi G, Dominici F, Burnett R, Cohen A, Krewski D, Samet J, Katsouyanni K.

"Estimates of the increased mortality associated with PM air pollution based on the APHENA study were generally comparable with results of previous reports. Overall, risk estimates were similar in Europe and in the United States but higher in Canada. However, PM(10) effect modification patterns were somewhat different in Europe and the United States."

(Environ Health Perspect. 2008 Nov;116(11):1480-6. Epub 2008 Jun 26, Accessed 6/5/11)

Particulate matter (PM10) air pollution, daily mortality, and hospital admissions: recent findings.

Colucci ME, Veronesi L, Roveda AM, Marangio E, Sansebastiano G.

"Various epidemiologic studies conducted in the last 10 years, such as the Air Pollution and Health-European Approach (APHEA) project, the National Morbidity, Mortality and Air Pollution (NMMAPS) Study and Italian Meta-analysis of Studies on the short-term effects of Air pollution (MISA), have shown that current ambient concentrations of PM10 may lead to increased mortality and morbidity."

(Ig Sanita Pubbl. 2006 May-Jun;62(3):289-304, Accessed 6/5/11)

Overview of the reanalysis of the Harvard Six Cities Study and American Cancer Society Study of Particulate Air Pollution and Mortality.

Krewski D, Burnett RT, Goldberg MS, Hoover BK, Siemiatycki J, Jerrett M, Abrahamowicz M, White WH.

"Phase I of the reanalysis involved the design of data audits to determine whether each study conformed to the consistency and accuracy of their data. Phase II of the reanalysis involved conducting a series of comprehensive analyses using alternative statistical methods. Alternative models were also used to identify covariates that may confound or modify the association of particulate air pollution as well as identify sensitive population subgroups. The audit demonstrated that the data in the original analyses were of high quality, as were the risk estimates reported by the original investigators. The sensitivity analysis illustrated that the mortality risk estimates reported in both studies were found to be robust against alternative Cox models. Detailed investigation of the covariate effects found a significant modifying effect of education and a relative risk of mortality associated with fine particles and declining education levels. The study team applied spatial analytic methods to the ACS data, resulting in various levels of spatial autocorrelations supporting the reported association for fine particles mortality of the original investigators as well as demonstrating a significant association between sulfur dioxide and mortality. Collectively, our reanalysis suggest that mortality may be attributable to more than one component of the complex mixture of ambient air pollutants for U.S. urban areas."

(J Toxicol Environ Health A. 2003 Aug 22-Oct 10;66(16-19):1507-51, Accessed 6/5/11)

Lifestyle and environmental factors associated with inflammation, oxidative stress and insulin resistance in children.

Kelishadi R, Mirghaffari N, Poursafa P, Gidding SS.

"The independent influence of inflammatory/oxidative mechanisms of air pollution effects on surrogate markers of atherosclerosis from early life should be highlighted."

(Atherosclerosis. 2009 Mar;203(1):311-9. Epub 2008 Jul 1, Accessed 6/5/11)

Immunotoxicity and environment: immunodysregulation and systemic inflammation in children.

Calderón-Garcidueñas L, Macías-Parra M, Hoffmann HJ, Valencia-Salazar G, Henríquez-Roldán C, Osnaya N, Monte OC, Barragán-Mejía G, Villarreal-Calderon R, Romero L, Granada-Macías M, Torres-Jardón R, Medina-Cortina H, Maronpot RR.

"Exposure to urban air pollution is associated with immunodysregulation and systemic inflammation in children and is a major health threat."

(Toxicol Pathol. 2009;37(2):161-9. Epub 2009 Jan 26, Accessed 6/5/11)

Systemic inflammation, endothelial dysfunction, and activation in clinically healthy children exposed to air pollutants.

Calderón-Garcidueñas L, Villarreal-Calderon R, Valencia-Salazar G, Henríquez-Roldán C, Gutiérrez-Castrellón P, Torres-Jardón R, Osnaya-Brizuela N, Romero L, Torres-Jardón R, Solt A, Reed W.

"Children chronically exposed to fine PM above the standard could be at risk of developing cardiovascular diseases, atherosclerosis, stroke, and other systemic effects later in life."

(Inhal Toxicol. 2008 Mar;20(5):499-506, Accessed 6/5/11)

Elevated plasma endothelin-1 and pulmonary arterial pressure in children exposed to air pollution.

Calderón-Garcidueñas L, Vincent R, Mora-Tiscareño A, Franco-Lira M, Henríquez-Roldán C, Barragán-Mejía G, Garrido-García L, Camacho-Reyes L, Valencia-Salazar G, Paredes R, Romero L, Osnaya H, Villarreal-Calderón R, Torres-Jardón R, Hazucha MJ, Reed W.

"Chronic exposure of children to PM(2.5) is associated with increased levels of circulating endothelin-1 and elevated mean pulmonary arterial pressure."

(Environ Health Perspect. 2007 Aug;115(8):1248-53, Accessed 6/5/11)

Long-term air pollution exposure is associated with neuroinflammation, an altered innate immune response, disruption of the blood-brain barrier, ultrafine particulate deposition, and accumulation of amyloid beta-42 and alpha-synuclein in children and young adults.

Calderón-Garcidueñas L, Solt AC, Henríquez-Roldán C, Torres-Jardón R, Nuse B, Herritt L, Villarreal-Calderón R, Osnaya N, Stone I, García R, Brooks DM, González-Maciel A, Reynoso-Robles R, Delgado-Chávez R, Reed W.

"Exposure to air pollution causes neuroinflammation, an altered brain innate immune response, and accumulation of Abeta42 and alpha-synuclein starting in childhood. Exposure to air pollution should be considered a risk factor for Alzheimer's and Parkinson's diseases, and carriers of the APOE 4 allele could have a higher risk of developing Alzheimer's disease if they reside in a polluted environment."

(Toxicol Pathol. 2008;36(2):289-310. Epub 2008 Mar 18, Accessed 6/5/11)

Pediatric respiratory and systemic effects of chronic air pollution exposure: nose, lung, heart, and brain pathology.

Calderón-Garcidueñas L, Franco-Lira M, Torres-Jardón R, Henriquez-Roldán C, Barragán-Mejía G, Valencia-Salazar G, González-Maciel A, Reynoso-Robles R, Villarreal-Calderón R, Reed W.

"The pathogenesis of Alzheimer's disease (AD) is characterized by brain inflammation and the accumulation of Abeta 42, which precede the appearance of neuritic plaques and neurofibrillary tangles, the pathological hallmarks of AD. Our findings of nasal barrier disruption, systemic inflammation, and the upregulation of COX2 and IL-1beta expression and Abeta 42 accumulation in brain suggests that sustained exposures to significant concentrations of air pollutants such as particulate matter could be a risk factor for AD and other neurodegenerative diseases."

(Toxicol Pathol. 2007;35(1):154-62, Accessed 6/5/11)

Air pollution and hospitalization for respiratory diseases among children in isfahan, iran.

Mansourian M, Javanmard SH, Poursafa P, Kelishadi R.

"This study confirms the findings of previous studies about the association of air pollutants' levels with hospitalization because of respiratory diseases in young children. Air pollution continues to pose a threat to public health notably in the paediatric age group, and underscores the need to re-examine national environmental health policies and standards in developing countries.

(Ghana Med J. 2010 Dec;44(4):138-43, Accessed 6/5/11)

Exposure to air pollution is associated with lung hyperinflation in healthy children and adolescents in Southwest Mexico City: a pilot study.

Calderón-Garcidueñas L, Mora-Tiscareño A, Chung CJ, Valencia G, Fordham LA, García R, Osnaya N, Romero L, Acuña H, Villarreal-Calderón A, Devlin RB, Koren HS.

"We investigated the association between exposure to a highly polluted urban environment with a complex mixture of air pollutants-ozone and particulate matter the predominant ones-and chest x-ray abnormalities in 59 healthy Mexican children who are lifelong residents of Southwest Metropolitan Mexico City (SWMMC), with a negative history of tobacco exposure and respiratory illnesses. Their clinical results and x-ray findings were compared to those of 19 Mexican control children, residents of a low-pollution area, with a similar negative history of tobacco exposure and respiratory illnesses. Ozone concentrations in SWMMC exceeded the U.S. Environmental Protection Agency (U.S. EPA) National Ambient Air Quality Standard (NAAQS) for O(3): 0.08 ppm as 1-h maximal concentration, not to be exceeded more than 4 times a year, on 71% of days in 1986 and 95% in 1997, with values as high as 0.48 ppm. Ozone maximal peaks are usually recorded between 2 and 5 pm coinciding with children's outdoor physical activities. Children in the control group reported no upper or lower respiratory symptomatology. Every SWMMC child complained of upper and/or lower respiratory symptoms, including epistaxis, nasal dryness and crusting, cough, shortness of breath, and chest discomfort. Children aged 7-13 yr had the most symptomatology, while 5- to 6-year olds and adolescents with the lowest number of statistically significant outdoor exposure hours had less respiratory symptoms. Bilateral symmetric mild lung hyperinflation was significantly associated with exposure to the SWMMC atmosphere ($p = .0004$). Chronic and sustained inhalation of a complex mixture of air pollutants, including ozone and particulate matter (PM), is associated with lung hyperinflation, suggestive of small

airway disease, in a population of clinically healthy children and adolescents. Small airways are a target of air pollutants in SWMMC children, with ozone and PM being most likely responsible, based on experimental animal, controlled-chamber, and epidemiological data available. Our main concern is the potential likelihood for the development of chronic lung disease in this highly exposed population."

(Inhal Toxicol. 2000 Jun;12(6):537-61, Accessed 6/5/11)

Interaction between air pollution and respiratory viruses: time-series study of daily mortality and hospital admissions in Hong Kong.

Wong CM, Thach TQ, Chau PY, Chan EK, Chung RY, Ou CQ, Yang L, Peiris JS, Thomas GN, Lam TH, Wong TW, Hedley AJ; HEI Health Review Committee.

"The biggest health impacts were seen at the extremes of the age range... In Hong Kong, where air pollution may pose more of a health threat than in North American and Western European cities, the effects of air pollution also interact with influenza and with residence in socially deprived areas, potentially leading to additional harm."

(Res Rep Health Eff Inst. 2010 Nov;(154):283-362, Accessed 6/5/11)

Assessment of physical education time and after-school outdoor time in elementary and middle school students in south Mexico City: the dilemma between physical fitness and the adverse health effects of outdoor pollutant exposure.

Villarreal-Calderón A, Acuña H, Villarreal-Calderón J, Garduño M, Henríquez-Roldán CF, Calderón-Garcidueñas L, Valencia-Salazar G.

"Strategies to promote lifelong physical activity among children are needed to stem the adverse health consequences of inactivity. However, the health effects in growing children of long-term exposure to a polluted atmosphere are of deep concern. The atmosphere of south Mexico City (SMC) is characterized by a complex mixture of air pollutants, including ozone, particulate matter, and aldehydes. Radiological evidence suggests that small-airway disease could be present in clinically healthy, tobacco unexposed SMC children... The authors believe that SMC children and adolescents must be educated, through both the school and health systems, regarding ways to obtain the necessary exercise while protecting themselves from the high concentrations of pollutants."

(Arch Environ Health. 2002 Sep-Oct;57(5):450-60, Accessed 6/5/11)

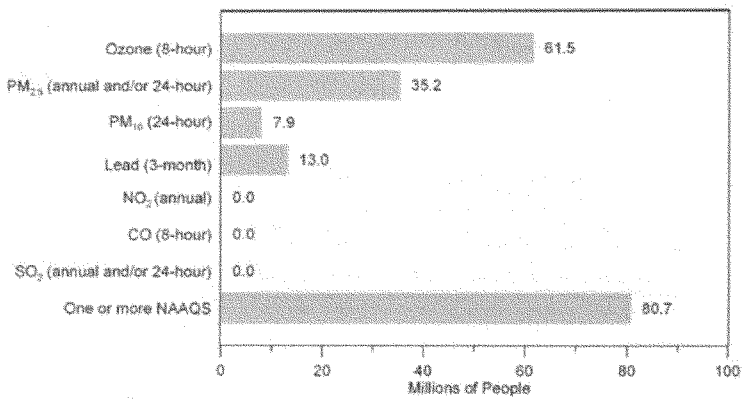
The Effects of Outdoor Air Pollutants on the Costs of Pediatric Asthma Hospitalizations in the United States, 1999 to 2007.

Roy A, Sheffield P, Wong K, Trasande L.

"Subchronic PM2.5 exposure is associated with increased costs for pediatric asthma hospitalizations. Policy changes to reduce outdoor subchronic pollutant exposure may lead to improved asthma outcomes and substantial savings in healthcare spending."

(Med Care. 2011 Mar 21. [Epub ahead of print], Accessed 6/5/11)

Number of People Living in Counties with Air Quality Concentrations Above the Level of the NAAQS in 2009



Multiple years of data are generally used to determine if an area attains the NAAQS. The chart above is for one year only. Source: U.S. Census Bureau, Population Division

(http://www.epa.gov/airtrends/aqtrends.html, Accessed 6/5/11)

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State of Rhode Island and Providence Plantations
State House
Providence, Rhode Island 02903-1196
401-222-2080

Donald L. Carcieri
Governor

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MAR 17 2009
OFFICE OF THE REGIONAL ADMINISTRATOR

March 12, 2009

Ira W. Leighton
Acting Regional Administrator
EPA Region I
1 Congress Street, (Suite 1100-RAA)
Boston, MA 02114-202

Dear Mr. Leighton:

Pursuant to the requirements of Section 107(d)(1) of the Clean Air Act Amendments of 1990, Rhode Island is hereby submitting its recommendation for the State's attainment status designation for the 2008 revised National Ambient Air Quality Standard (NAAQS) for ozone. Section 107(d)(1) defines nonattainment areas as areas that do not meet, or that contribute to ambient air quality in a nearby area that does not meet, the NAAQS for a pollutant.

A site is in violation of the eight-hour NAAQS if the monitored design value for that site is greater than 75 ppb. The design value is calculated by averaging the fourth highest maximum daily eight-hour ozone concentration measured at a site each year in three consecutive years. The eight-hour ozone design values for the three Rhode Island ozone monitoring sites for the two most recent three-year periods, 2005 – 2007 and 2006 - 2008, are as follows:

Site	County	Design Value (ppb)	
		2005-2007	2006-2008
W. Greenwich	Kent	86	80
Narragansett	Washington	84	81
E. Providence	Providence	84	82

Since the design values for all three of the Rhode Island monitoring sites exceed 75 ppb, the entire State of Rhode Island is in monitored violation of the 2008 ozone NAAQS.

EPA's guidance for designating areas for the 2008 revised ozone NAAQS[1] states that the Core Based Statistical Area (CBSA) associated with the violating monitor should be used to determine the presumptive boundaries of a nonattainment area. All of the Rhode Island monitors are located in the Providence--New Bedford-Fall River RI-MA CBSA, which includes all five of the Rhode Island counties and Bristol County in Massachusetts.

For ease of administration, I am recommending that, as with previous ozone NAAQS, the Rhode Island 2008 ozone nonattainment area be defined by the boundaries of the State of Rhode Island, rather than the boundaries of the CBSA. Bristol County, Massachusetts would continue to be included in the Eastern Massachusetts nonattainment area, which has similar design values as those in Rhode Island.

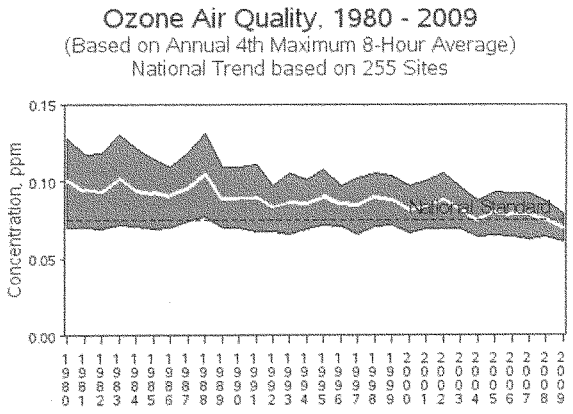
Although I am not asking that upwind areas be included in the Rhode Island nonattainment areas, Rhode Island is keenly aware that the State's ozone levels are strongly influenced by upwind states' emissions. Therefore, if Rhode Island is to come into attainment with the 2008 ozone NAAQS, it is essential for EPA to adequately address long-range transport of ozone and ozone precursors.

If you have any questions about this issue, please feel free to contact Barbara Morin at the Rhode Island Department of Environmental Management's Office of Air Resources at (401) 222-4700, extension 7012.

Very truly yours,

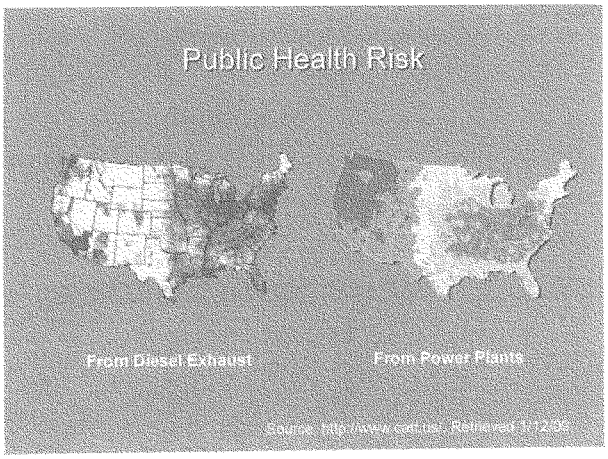
Donald L. Carcieri
Governor

1 Memo from Robert J Meyers, Principal Deputy Assistant Administrator, US EPA, to Regional Administrators, "Area Designations for the 2008 Revised Ozone National Ambient Air Quality Standards," December 4, 2008.



1980 to 2009 : 30% decrease in National Average

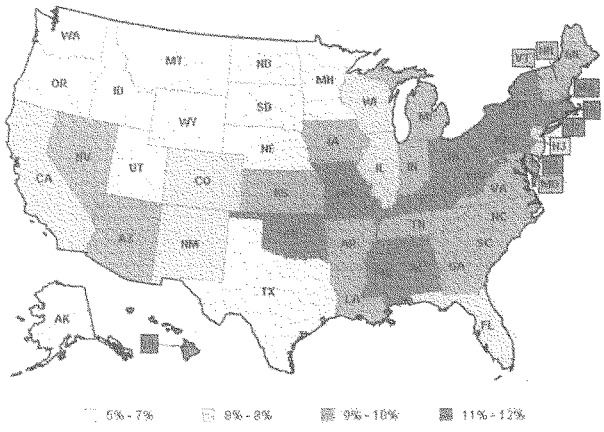
(http://www.epa.gov/airtrends/ozone.html#ozloc, Accessed 6/5/11)



(Slide from Presentation – J. Ginda)

Ginda - Testimony References

Nationwide Childhood Asthma Map



Percent of children with asthma problems (Percent) - 2007

KIDS COUNT Data Center, www.kidscount.org/datacenter
A Project of the Annie E. Casey Foundation

Definitions: The share of children under age 18 affected by asthma during the past year.

Data Source: Child Trends analysis of data from the U.S. Department of Health and Human Services, Health Resources and Services Administration, Maternal and Child Health Bureau, National Survey of Children's Health.

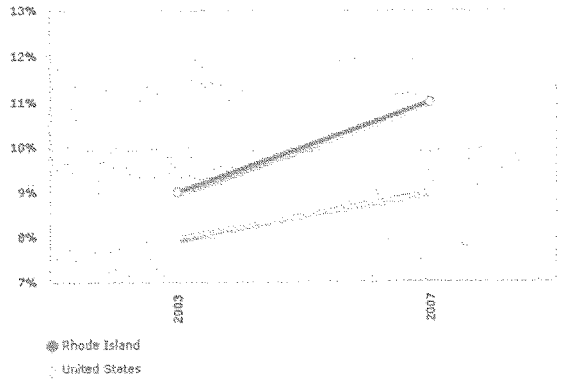
Footnotes: Updated July 2009.
N.A. - Data not available.

Note: Maps use the natural break classification method, which reflects patterns in the data by dividing the map into naturally occurring groups. Using statistical tools, this method determines cut-off points for each group by identifying large gaps in data values.

Note: The District of Columbia, Puerto Rico and the U.S. Virgin Islands are not included in maps and rankings because they are not states and therefore comparisons on many indicators of child well being are not meaningful.

(Source: The Annie E. Casey Foundation, KIDS COUNT Data Center, www.kidscount.org/datacenter, *Accessed 6/6/11)*

Rhode Island Childhood Asthma vs. Nationwide Childhood Asthma



Percent of children with asthma problems (Percent) - 2003 to 2007

KIDS COUNT Data Center, www.kidscount.org/datacenter
A Project of the Annie E. Casey Foundation

	Rhode Island	United States
2003	9%	8%
2007	11%	9%

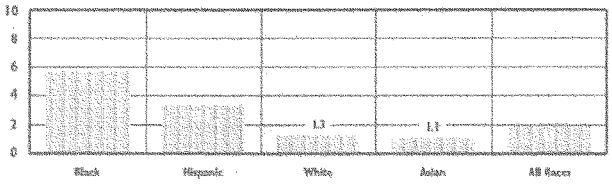
Definitions: The share of children under age 18 affected by asthma during the past year. Children affected by asthma are defined as those who have ever been diagnosed by a doctor or health professional as having asthma and who still have asthma, and who experience one or more of the following: used medication for asthma in the past year, had moderate or severe difficulties due to asthma, had an asthma attack in the past year, and/or had been hospitalized for asthma in the past year.

Data Source: Child Trends analysis of data from the U.S. Department of Health and Human Services, Health Resources and Services Administration, Maternal and Child Health Bureau, National Survey of Children's Health.

Footnotes: Updated July 2009.
N.A. - Data not available.

(Source: The Annie E. Casey Foundation, KIDS COUNT Data Center, www.kidscount.org/datacenter, *Accessed 6/6/11)*

Asthma Hospitalizations With Primary Diagnosis of Asthma, by Race/Ethnicity, per 1,000 Children Under Age 18, Rhode Island, 2005-2009



Sources: Rhode Island Department of Health, Hospital Discharge Database, 2005-2009; U.S. Census Bureau, Census 2000.

In Rhode Island between 2005 and 2009, the hospitalization rate for primary diagnosis of asthma for Black children (5.7 per 1,000 children) was more than four times the rate for non-Hispanic White children (1.3 per 1,000 children). Between 2005 and 2009, Hispanic children in Rhode Island were hospitalized for asthma two and a half times as often as White children.

Health Care Costs for Childhood Asthma in Rhode Island

It is estimated that 17% (39,000) of all children in Rhode Island have ever been diagnosed with asthma and 11% (27,000) currently have asthma. The asthma prevalence among Rhode Island children increased 2% between 2005 and 2007.[12]

Health care use for asthma (including hospitalizations and emergency room use) is highest among young children under age five.[13,14]

The average length of a hospitalization stay for a child with asthma in Rhode Island is two days, with an average charge of $7,840. In Rhode Island, children under age five have the highest number of asthma hospitalizations and the highest charges compared with all other children. Total hospital charges for children under age five are nearly six times more than those for adolescents 12 to 17 years of age.[15]

In Rhode Island in 2007, there were 1,856 emergency room visits by children with a primary diagnosis of asthma at an average charge of $1,823 per visit. Children under age five accounted for 46% of all emergency room visits with an average charge of $2,013.[16]

(Children with Asthma, 2011 Rhode Island KIDS COUNT Factbook / Health, p 74)

Pediatric patient asthma-related emergency department visits in Rhode Island from 2005 to 2009 and associations with socioeconomic status[1]

Deborah N. Pearlman, PhD, Jian Gong, PhD, Gregory A. Wellenius, ScD

Background: Despite the overwhelming evidence that air pollution affects hospital use for asthma and other respiratory illnesses, significant challenges remain.[2] One challenge is that studies conducted within the United States and Canada show considerable variation in the relation of ambient air pollution to pediatric asthma emergency department visits from one geographical area to another and overtime in the same region. A second challenge is that studies that have explored whether the effect of air pollution on asthma emergency department visits is greater for children of lower socioeconomic status (i.e., children on Medicaid and children in low-income neighborhoods) have produced mixed results. Some,[3,4,5] but not all studies,[6,7] find that the effect of pollution on pediatric asthma emergency department visits appears to be larger for children of lower socioeconomic status.

Objective: To examine the effects of short-term exposure to ambient concentrations of ozone and particulate matter ($PM_{2.5}$) on pediatric emergency department visits for asthma and upper respiratory infections in Rhode Island and to explore whether the strength of the association between respiratory-related emergency department visits and air pollution was modified by socioeconomic status.

Methods: Data on pediatric emergency department visits during 2005 to 2009 came from the Rhode Island Department of Health's public use data file from the state's 11 acute care general hospitals and included emergency department visits for children discharged home and admitted as an inpatient. Primary international classification of disease 9th revision (ICD-9-CM) diagnostic codes were used to define an emergency department visit for asthma (493) and upper respiratory infections (460–466, 477) with any fourth or fifth digit extension.

We obtained daily measures of $PM_{2.5}$ from five monitoring stations in operation in Rhode Island from the US Environmental Protection Agency (EPA) and computed daily statewide mean concentrations of the pollutant. We obtained hourly measures of ozone from three Rhode Island monitors from the US EPA, averaged the hourly values across all monitors, and computed the daily statewide eight-hour mean ozone levels from March to October of each year. Data on ambient temperature, dew point temperature and barometric pressure came from the National Weather Service station at TF Green airport in Warwick, Rhode Island.

A time-stratified case-crossover design was used to evaluate the association between pollutant levels and respiratory-related emergency department visits. In this design, each subject's exposure before a case-defining event (case period) is compared with his or her own exposure experience during one or more control periods when the subject did not become a case. We chose control periods such that exposures during the case period were compared with exposures occurring on other days of the same month falling on the same day of the week as the case period. This design is effective in controlling for seasonality, time trends, and chronic

and slowly varying potential confounders. For each pollutant, we simultaneously evaluated the association of pollution levels 0 to 2 days prior to admission (lags 0-2 days) using unconstrained distributed lag models. We performed conditional logistic regression to obtain estimates of odds ratios and 95% confidence intervals (CIs). We report effect estimates as the percent change in the rate of ED visits per interquartile range (IQR) increase in mean daily pollutant levels. In all models, we controlled for potential confounding by ambient temperature and dew point temperature using natural cubic splines with 3 degrees of freedom for each variable.

Socioeconomic status was measured at the individual and neighborhood level, based on insurance status (private versus Medicaid) and the percentage of residents in a census tract living at or below the federal poverty level (<20% versus ≥20%).

Results: Associations between pediatric emergency department visits for respiratory-related conditions and exposure to $PM_{2.5}$ were *significant and strongest for children on Medicaid and for children living in high poverty neighborhoods.* At lag 0 days (day of admission), an emergency department visit for asthma was increased by 5% for children enrolled in Medicaid (Odds ratio: 1.05, 95% CI 1.01, 1.10) for an interquartile increase of 6.8 $\mu g/m^3$ in $PM_{2.5}$, adjusted for temperature and relative humidity. An interquartile increase of 6.8 $\mu g/m^3$ in $PM_{2.5}$ was associated with a 3% increase in emergency department visits for upper respiratory infections at lag 1 day for children enrolled in Medicaid, adjusted for temperature and relative humidity (Odds ratio: 1.03, 95% CI = 1.01, 1.05).

At lag 0 days (day of admission), an emergency department visit for upper respiratory infections was increased by 4% for children living in high poverty neighborhoods for an interquartile increase in $PM_{2.5}$ of 6.8 $\mu g/m^3$, adjusted for temperature and relative humidity (Odds ratio: 1.04, 95% CI 1.01, 1.06). At lag 1 day (exposure to pollutant 1 day prior to admission), a 0.02-ppm increase of in ozone concentration was associated with a 4% increase in emergency department visit for upper respiratory infections, adjusted for temperature and relative humidity, although the 95% confidence intervals slightly overlapped 1.00 (Odds ratio: 1.038, 95% CI = 0.99, 1.09). Increases in ozone concentrations were not associated with pediatric asthma emergency department visits at lag 0, 1 or 2 days.

Conclusion: Understanding the link between pollution and children's health has become increasingly important to a wide audience in Rhode Island and nationally. The results of the current study show real increases in the relative risk of pediatric emergency department visits for asthma and upper respiratory infections for children enrolled in Medicaid and for children living in high poverty neighborhoods. Automobile exhaust contributes heavily to $PM_{2.5}$ pollution and many of Rhode Island's high poverty neighborhoods abut interstates 95 and 195, the heaviest traveled roads in the state. Even at relatively low concentrations of ozone and $PM_{2.5}$, outdoor pollution contributes to the burden of emergency department visits for pediatric asthma and upper respiratory infections in children of lower socioeconomic status.

References

[1] Dr. Pearlman and Dr. Wellenius are on the faculty of the Brown University Warren Alpert School of Medicine Program in Public Health. Dr. Pearlman is also Senior Epidemiologist at the Rhode Island Department of Health Asthma Control Program. At the time this study was conducted, Dr. Gong was completing a Masters in Biostatistics at Brown University. Appreciation is extended to Nancy Sutton, RD, MS, Program Manager, Rhode Island Department of Health Asthma Control Program for her ongoing support of this project and its potential contribution to Rhode Island's commitment to improve quality of life for Rhode Islanders with asthma. This study was funded, in part, by a grant from the U.S. Centers for Disease Control and Prevention Cooperative Agreement Award Number: 5U59EH000199-03, Addressing Asthma from a Public Health Perspective.

[2] Wilson AM et al. Air pollution and the demand for hospital services: a review. Environment International 30 (2004) 1109– 1118.

[3] Gwynn RC, Thurston GD. The Burden of Air Pollution: Impacts among Racial Minorities. Environmental Health Perspectives. 2001.

[4] Nauenberg E, Basu K. Effect of insurance coverage on the relationship between asthma hospitalizations and exposure to air pollution. Pubilc Health Rep. 1999; 114:135-148.

[5] Neideli MH. Air pollution, health, and socio-economic status: the effect of outdoor air quality on childhood asthma. J Health Economics. 2004; 23: 1209-1236.

[6] Tolbert PE, et al. Air quality and pediatric emergency room visits for asthma in Atlanta, Georgia, USA. Am J Epidemiol 2000;151:798–810.

[7] Delfino RJ, Chang J, Wu J, Ren C, Tjoa T, et al. Repeated hospital encounters for asthma in children and exposure to traffic- related air pollution near the home. Ann Allergy Asthma Immunol 2009;102(2):138-44.

(Rhode Island Department of Health Asthma Control Program, 6/6/11)

Ginda - Testimony References

Responses to Follow-up Questions from:

Senator Thomas R. Carper

1. **On the day of our hearing, D.C., parts of Maryland and all of Delaware were under a code orange alert for ozone health concerns. Can you take a moment and explain what this means and what it might mean for a child with asthma?**

Yes Senator Carper, and thank you for your question. The code orange alert for ozone health concerns on that day referred to an elevated risk of illness for sensitive groups because of increased levels of ground-level ozone. I will respond with a brief look at ozone, explain the specifics of what leads to an air quality alert such as that one, and then respond to the second part of your question about a child with asthma.

To better understand ozone requires a basic understanding of oxygen. It is well known that we need oxygen to support life. Oxygen (O) is present in our atmosphere in the form of a gas, composing 21% of the air that we take in with each breath. Oxygen cannot be stored in the body and breathing constantly replenishes the supply. Oxygen can also be toxic at too high a level of exposure over time, but the level in our atmosphere does not present a problem for us. Two oxygen atoms often share electrons to achieve a lower energy state, so oxygen most commonly exists in what is known as a diatomic form with the two oxygen (O) atoms together referred to as "O_2."

Oxygen can also exist in a less stable triatomic form with the temporary addition of another free oxygen atom, and this allotrope or variation of oxygen is known as ozone or "O_3." The formation and breakdown of ozone normally occur as part of nitrogen cycle reactions in the environment, and ozone can be formed by natural events such as lightning. Oxygen is odorless, but ozone has a pungent odor that may be noticeable in the air after an electrical storm. Ozone is also formed when ultraviolet radiation from sunlight acts upon air pollutants such as nitrogen oxides and volatile organic compounds, freeing up an oxygen atom which can bond with the diatomic form of oxygen to create ozone.

When air pollution is higher and ozone precursors are more plentiful, the intense solar radiation of summer supplies the ultraviolet rays to cause the photochemical reactions that result in increased ground level ozone in the air that we breathe. This reactive oxygen species can also be trapped and regionally concentrated by topography of the land and weather conditions. Ozone adds oxidative stress and is a respiratory irritant that can trigger asthma. Ground level ozone is one of the principal pollutants that are measured and reported in an attempt to protect the public from air pollution.

The Clean Air Act of 1963 and subsequent amendments have provided the framework for federal regulations on air quality. The U.S. Environmental Protection Agency (EPA) sets federal air quality standards, and works with local agencies to maintain an air quality monitoring network. Local agencies are required to report local air quality from their monitoring networks using the Air Quality Index (AQI). This is intended to give the general public information they can understand and act on, for example if they are in a sensitive group, as in this particular code orange alert day. The local reporting agencies in this air quality alert example would be the District of Columbia Department of Health Air Quality Division, Maryland Department of Environment, and Delaware Department of Natural Resources and Environment.

The AQI ranges from 0-500, and has corresponding color codes across the scale. It is calculated using a formula that converts the measured level of each of 4 principal pollutants into a number on this scale for each pollutant. The 4 principal pollutants for AQI calculations are ground level ozone, particulate matter, carbon monoxide, and sulfur dioxide. On the index scale of 0-500, a value of 100 generally corresponds with the established threshold level for each principal pollutant. The colors associated with each portion of the range of the scale are designed to express a level of health concern for the given AQI value (and corresponding actual measured level of that pollutant).

On the AQI scale, 0-50 would indicate good air quality and have a green color. 51-100 would mean the pollution level has increased to the moderate range, and be indicated by a yellow color. Values of 101-150 mean the air is unhealthy for sensitive groups, and is indicated by an orange color. Values of 151-200 mean the air is unhealthy for everyone and is indicated by a red color. 201-300 is very unhealthy and has a purple color. 301-500 is hazardous air, and would be indicated by a maroon color on the AQI scale. On the day of the hearing, a code orange air quality alert for D.C., Maryland, and Delaware was to inform the public that ground level ozone had an indexed value of 101-150, and the health concern at that level is that the air is unhealthy for sensitive groups.

Children are considered a sensitive group because of their higher respiratory rate, the amount of air they move in and out of their lungs each minute which we refer to as minute ventilation, and the time they spend outdoors playing. Ozone has clearly been established as an asthma trigger, and therefore children with asthma are even more susceptible to having breathing difficulties and worsening asthma symptoms on days such as the code orange day you referred to in your question. This can lead to more uncontrolled asthma and lost school days, lost work days for parents, less outdoor activities like recess at school, increased medication usage, increased acute care and emergency visits, diagnostic tests, and potential hospitalization, all of which add to the burden of asthma which is the most common chronic disease of childhood.

Senator David Vitter

1. **Mr. Ginda, you currently serve on the American Lung Association of New England, Rhode Island Public Policy Committee (2009-Present). Is that correct?**

   Looking at the ALA Rhode Island Public Policy Agenda for 2011, Tobacco and outdoor wood boilers and wood stoves are noted as a priority. Why was ozone omitted as a priority?

Yes, that is correct Senator Vitter. I am currently on the Rhode Island Public Policy Committee for the American Lung Association of New England (in a voluntary, unpaid advisory role).

In the conference call where we reviewed the state policy agenda for 2011, I do not recall an intentional omission of ozone as a priority, but rather just a focus on other air quality issues at the forefront in Rhode Island at the time. Healthy energy and fuel which help reduce ozone precursors were at the top of the list in 2010, and efforts continue in that area as well. It is stated in the ALA Rhode Island Health Promotion and Public Policy Accomplishments publication for July 1, 2009 – June 30, 2010, and highlighted in bold print, that American Lung Association in Rhode Island leadership board members signed on to a letter asking EPA administrator Lisa Jackson to strengthen ozone standards in the Clean Air Act. I believe there was hope this would be accomplished, and with downwind sources still problematic, thought to be a necessary part of continuing to improve air quality locally.

While it was before my time on the committee, in 2008 an element of the state ozone attainment plan included "A Reasonably Available Control Measures (RACM) analysis showing there are no additional emissions control requirements for point and nonpoint sources that could be adopted in Rhode Island that would advance the State's attainment year." In July of 2011, Rhode Island Department of Environmental Management monitoring for ozone showed maximum 8 hour ozone concentrations to be elevated in the moderate (yellow) range on 15 days of the 31 days of July at one or more monitoring locations in the state, and in the unhealthy for sensitive groups (orange) range on 4 days in July. In 3 out of those 4 (orange) days, the elevations were measured at two reference sites in the western and southern portions of the state, and not at the urban monitoring location in close proximity to Interstates 95 and 195.

With action on a national level to address ozone, it allowed more focus on other issues for state action. In this past state legislative session for example, there was also a push for municipal waste incineration that necessitated a timely response and elevated priority given the health risks from this source of particulate matter.

2. **Mr. Ginda, the CDC's National Asthma Control program reporting in the recent America Breathing Easier brochure that the causes of asthma are largely unknown. Do you agree with this assessment regarding the causes of asthma?**

Yes Senator Vitter, I do generally agree with the assessment with the following considerations. In the same sentence of that brochure where it says the cause of asthma is largely unknown, the sentence continues on to say "although sometimes having asthma is linked to a specific trigger such as having inhaled certain chemicals at work. However, if someone in your family has asthma, you are more likely to have it, so there may be a hereditary component to the disease." This brochure also states on the same page that, "In some people a single trigger can set off an asthma attack, while for others several triggers must be present at the same time."

Pinpointing an exact cause has been difficult because who actually develops asthma appears to depend on a complex combination of genetics and environment where there is considerable variability in both domains. There is a strong allergic link for many, and genetic predisposition for developing asthma has also been suggested in the discovery of asthma susceptibility genes on various chromosomes. Much has been learned about the allergic response, cellular signaling, and pathways that may be involved or overly sensitive to certain stimuli. Whatever the causative factor or combination of factors may be for a particular asthmatic individual, an inflammatory response and bronchial smooth muscle spasm is triggered which leads to airway narrowing, mucous production, and difficulty breathing as a result of airflow obstruction.

3. **Can you explain why asthma rates have been going up while pollution rates have been going down dramatically?**

That is a great question Senator Vitter, and one which continues to be researched. There is no clear explanation at this point that I am aware of, but the answer is likely multi-factorial. I believe it is a combination of genetics, environment, and lifestyle. While air pollution is an important component of environment, it is only part of the composite whole in terms of asthma prevalence. Asthma susceptibility genes have been identified, and polymorphisms of genes associated with the inflammatory process may likely play a role in how some react to environmental irritants, so genetic predisposition passed on to children may be part of the current population prevalence, which is then affected by individually variable, multiple outdoor and indoor environmental triggers.

While I would agree that pollution levels have indeed come down historically thanks to heightened public awareness of risks, and federal, state, and local action, I believe we still pollute our environment in myriad ways, and often realize the environmental antecedents of disease years later. For example, there is concern about potential effects of air pollution later in life expressed in the Mexico City study data I presented in my testimony *(Calderón-*

Garcidueñas L, Mora-Tiscareño A, et al, 2006). Although there were alarmingly high percentages of significant abnormalities seen on the lung radiographs and computerized tomography in healthy children, they saw a lower percentage of current pulmonary function abnormalities. These types of radiological exams are not typically done on a routine basis in healthy children, nor really is screening spirometry for that matter. I would be concerned about underlying inflammatory changes as a result of exposure to air pollution that may be otherwise unrecognized and uncontrolled, and could contribute to increased asthma prevalence if there is a later clinical diagnosis of asthma when a previously healthy child becomes symptomatic.

As pollen profiles change with season and climate, there may also be a connection with allergic asthma in atopic individuals. From a lifestyle perspective, in non-allergic asthma, obesity has clearly increased in the population and a pro-inflammatory state has been suggested as part of an obese asthma phenotype. Increased obesity in adults and children can also increase risk of gastro-esophageal reflux which can be an asthma trigger. Smoking, environmental tobacco smoke, living conditions, and indoor air quality are still issues for many in the population, so these also likely play a role in current asthma prevalence. Also related to lifestyle is that we have a more mobilized society with greater energy needs than ever, and both transportation and industrial sources of pollution still exist where controls are not mandated or inadequate.

From a microbial perspective, some have questioned the potential role of viruses such as rhinovirus for example, and others have proposed a hygiene hypothesis whereby less infections in childhood and less exposure to other children with smaller families may result in an altered immune response and an overstimulation of that pathway in response to a causative agent. In summary, while having to answer no at the present time in terms of an absolute scientifically conclusive answer, I just wanted to offer an explanation of some of the potential contributing or causative factors being considered, and I appreciate the question.

4. **Mr. Ginda, CDC reports that asthma symptoms can be triggered by breathing in allergy-causing substances including animal dander, changes in weather, exercise, mold, pollen, respiratory infections, strong emotions, stress, tobacco smoke and air pollution. It goes on to state that eliminating tobacco smoke from the home is the single most important thing a family can do to help a child with asthma. Do you agree that eliminating tobacco smoke from the home is the single most important thing you can do to help children with asthma?**

I agree with all of the listed triggers of asthma symptoms and that eliminating tobacco smoke from the home is certainly very important for an asthmatic. As far as being the single most important thing however, my answer would depend on the situational relevance of that recommendation based on the individual circumstances. Each of those triggers may have more or less of an effect on the asthma control for a particular child and that is what makes agreeing

or disagreeing with a rank order difficult. While avoiding tobacco smoke clearly is beneficial, perhaps making sure that rescue medication is available for the child at school would be a top priority in a particular situation.

I have not seen that statement in the context of where it was made, but the educational intent was likely to emphasize to family members the importance of eliminating tobacco smoke if it is present in the environment of an asthmatic child. In a CDC publication titled "You Can Control Your Asthma – A Guide to Understanding Asthma and its Triggers," there is a statement which says "Parents, friends, and relatives of children with asthma should try to stop smoking and should never smoke around a person with asthma. They should only smoke outdoors and not in the family home or car. They should not allow others to smoke in the home, and they should make sure their child's school is smoke-free."

Sometimes a seemingly obvious asthma trigger such as tobacco smoke may be prevalent in the indoor environment, yet parents, relatives, or friends do not recognize the impact on the child. I am reminded of this when I see children having to ride in cars with someone smoking which is clearly not in the best interest of any child, let alone a child who may have asthma. Tobacco smoke is worthy of general educational emphasis because it is a relatively common and modifiable risk factor in the indoor environment, and good advice for a family to consider as a first step in helping a child with asthma who may be exposed to tobacco smoke.

5. Of all the potential triggers for asthma symptoms, where do you rank current ambient levels of ozone?

This is another great question that I have given a lot of thought, but it is difficult to rank current ambient levels of ozone in comparison to other triggers. When I reflect on seasonal variability with ozone and the long sunny days of summer with more outdoor activity, I also consider the same seasonal variations that exist with other outdoor asthma triggers such as different pollens. Many triggers in the indoor environment such as mold or dust mites may exist year-round and be more problematic for some, but a key difference to me is that while remediation of these indoor triggers may be possible to some degree in order to maintain better asthma control, outdoor air quality is most often out of the realm of individual control. Asthma is a heterogeneous disease with individual variability, and levels of ambient ozone can be high enough to be a problem for asthmatics.

Some individuals may be genetically more susceptible to the oxidative stress of ozone while others may be more genetically protected. A recent paper out of UNC Chapel Hill in July of this year (Peden DB, Immunol Rev. 2011 Jul;242(1):91-105) describes ozone as a common environmental contaminant that causes asthma exacerbation, and describes the phenotype response characteristics. If also notes that innate immune responses are affected by oxidative

stress, and that ozone has "the ability to enhance the response to inhaled allergen." This makes me think about the potential role ozone may play even in allergic asthma. Since there are an increasing number of patients with asthma and other chronic lung diseases, more people are especially susceptible to ozone exposure and the oxidative stress of this reactive oxygen species in the lungs. There is also evidence that suggests adverse effects in healthy individuals.

In 2008, a secondary analysis of existing data for 30 healthy young volunteer adults exposed to 0.06 parts per million of ozone showed showed that "Exposure to 0.06 PPM O_3 causes a biologically small but highly statistically significant decrease in mean FEV(1) responses of young healthy adults (Brown JS, Bateson TF, et al. Environ Health Perspect 2008; 116(8): 1023-6)." Although the reduction in the amount of air that could be forcefully exhaled in the first second was on average 2.85%, there were two in the group had a decrease greater than 10%.

Earlier this year in 2011, a study was published on a group of 59 healthy adults age 19-35. In that study, the researchers looked at measured pulmonary function and subjective symptoms immediately before and after exposure to 0.0 parts per million (ppm) ozone, and 0.06 ppm oxone for 6.6 hours in a chamber while undergoing intermittent moderate exercise. They also measure polymorphonuclear neutrophil influx in 24 of those subjects 16 to 18 hours post-exposure. These are the types of cells one would typically seen in a non-allergic inflammatory response. They concluded that "Exposure of healthy young adults to 0.06 ppm ozone for 6.6 hours causes a significant decrement of FEV(1) and an increase in neutrophillic inflammation in the airways. GSTM1 genotype alone appears to have no significant role in modifying the effects (Kim CS, Alexis NE, et al. Am J Respir Crit Care Med 2011; 183(9): 1215-21)."

6. **Mr. Ginda, A 2008 study by O'Conner et al. in the Journal Allergy and Clinical Immunology examined the relationship between various pollutants including ozone and lung function, symptoms, and school absences, in 861 inner city children with persistence asthma. The study was conducted by researchers at EPA, seven leading medical centers and the National Institute of Allergy and Infectious Diseases. The study reported "ozone concentrations were not significantly associated with symptoms or school absences" and the "changes in lung function were small and not statistically significant." Mr. Ginda, are you familiar with this study? Can you speak to its conclusions?**

Yes Senator Vitter—This study was titled "Acute respiratory health effects of air pollution on children with asthma in US inner cities." The background of the study was that children with asthma in inner cities may be particularly vulnerable to the effects of traffic related air pollution. It was designed to look at fluctuations in outdoor air pollution and effect on asthma morbidity in inner city children. The researchers looked at 861 children with persistent asthma in 7 urban communities in the United States. Interestingly, almost all pollutants from

aerometric monitoring data measurements were below the National Ambient Air Quality Standards.

In this study, they did find that effect estimates in 1 day and 5 day average concentrations models for ozone were not different. The effects on forced expiratory volume and peak expiratory flow rate were smaller and not statistically significant. When looking at the results in a 3 pollutant model which included ozone, particulate matter 2.5 microns in diameter (PM 2.5), and nitrogen dioxide as predictors of forced expiratory volume in 1 second (FEV1), they found higher levels of PM 2.5 and nitrogen dioxide were independently associated with decreases in FEV1.

There was an association of similar magnitude between ozone and FEV1 but it was not statistically significant. However, when looking at the 3 pollutant model for peak expiratory flow rate, 5 day average concentrations of nitrogen dioxide and ozone were independently associated with a significantly lower peak expiratory flow rate. FEV1 may be a more sensitive test for mild airflow limitation, but decreased peak expiratory flow rate in and of itself suggests the presence of airflow obstruction and is an objective measurement that appears to be predicted by ozone. Nitrogen dioxide and ozone also remained significant predictors of peak expiratory flow rate in 5 pollutant models.

The authors also state in their discussion that associations between 5 day average and lung function vs. 1 day average and lung function is consistent with previous reports. In their conclusion they state that "Among inner-city children with asthma, short-term increases in air pollutant concentrations below the National Ambient Air Quality Standards were associated with adverse respiratory health effects (O'Connor GT, Lucas N, et al. J Allergy Clin Immunol. 2008 May;121(5):1133-1139)."

7. **Another study by Schildcrout et al in the American Journal of Epidemiology was a large study of 990 asthmatic children in eight American cities that examined the relationship between exposure to ozone, daily symptoms and use of rescue inhalers. The study was conducted by researchers at the University of Washington School of Medicine, University of North Carolina School of Public Health and Vanderbilt School of Medicine. It was sponsored by the Environmental Protection Agency and the Childhood Asthma Management Program of the National Heart, Lung, and Blood Institute. This study reported that "ozone was unrelated to asthma exacerbations." Mr. Ginda, are you familiar with this study? Can you speak to its conclusions?**

Yes Senator Vitter—The researchers in this study looked at 990 children in 8 North American cities over 22 months and sought to investigate the relationship between 5 EPA criteria pollutants and asthma exacerbations which were gauged by daily symptoms and use of rescue

inhalers. They note in the introduction that "Of the Environmental Protection Agency's six criteria pollutants, particulate matter and ozone have exhibited the most evidence of associations with asthma exacerbation," and they cite 12 references for this statement. With respect to study design, they also note "Because the health effects of ozone are thought to occur during the warm season, we limited the analysis of ozone to the months of May through September in 1994 and 1995," so ozone was an exception in the intended representation of year-round associations with the other pollutants.

Although their findings differ from other studies, they found no warm season effect of ozone on asthma exacerbations in this particular study. They stated that the lack of observed association between ozone and asthma exacerbations in their study was not expected given what has been reported in previous research. For comparison, in their introductory discussion they refer to an example of another large analysis of 846 children living in 8 distinct cities participating in the National Cooperative Inner-City Asthma Study which found that "during the summer months, levels of ozone, nitrogen dioxide, and sulfur dioxide were associated with morning asthma symptoms in single-pollutant models (Mortimer KM, Neas LM, et al. Eur Respir J 2002;19:699–705)."

Strengths of the study are the inclusion criteria and follow-up, the total number of children, and the length of the period of observation. Their modeling methodology and statistical methods in the analysis involve a level of bio-statistical complexity that is beyond my level of expertise, but I would also offer that the authors appeared as surprised as I was by the lack of effect they found in this study with warm season ozone in contrast with other research. The reason for this contrasting finding may be what the authors themselves offer in subsequent discussion when they state "A total of 990 children were followed over the course of 22 months; however, on a given day, the average number of children observed was approximately 12 per city, making season-specific effects difficult to capture. More thorough city-specific analyses may also be appropriate for the analysis of ozone (Schildcrout JS, Sheppard L. Am J Epidemiol 2006;164:505–517)."

Thank you for your questions Senator Carper and Senator Vitter. I hope my responses have contributed to the discussion and very much appreciate the opportunity to share them.

Senator CARPER. Thank you, Mr. Ginda. Exactly five. Exactly 5 minutes. This is eerie.

Now, before Senator Udall showed up and joined this hearing, we would go seven, eight, nine, 10 minutes. I don't know what it is, but this is pretty impressive. Not even calling the shots here. We have had two consecutive witnesses who have come in at exactly 5 minutes.

We will see how you do, here.

STATEMENT OF JULIE E. GOODMAN, PH.D., DABT, PRINCIPAL, GRADIENT

Ms. GOODMAN. I will be under.

Senator CARPER. OK, well, talk slowly, then.

Ms. GOODMAN. Good morning, and thank you for the opportunity to testify regarding air quality and children's health. I am Julie Goodman, Ph.D., a diplomate of the American Board of Toxicology. I am a Principal at Gradient, a firm specializing in human health risk assessment in Cambridge, Massachusetts. I also teach a graduate level epidemiology course at the Harvard School of Public Health.

I am presenting testimony this morning on my own behalf as an independent scientist. I am not representing myself under any Federal contract or grant.

Clean air and children's health are very important to me, both as a scientist and as a mother. We all want clean air and appropriate standards if they result in health benefits. But unless there is evidence that standards would improve health or reduce the disease burden associated with air pollution, resources should be used toward other measures that would more clearly benefit society.

Several issues with EPA's risk assessment methodologies were noted this year by a committee assembled by the National Research Council, or NRC, of the National Academy of Sciences. This committee reviewed EPA's draft assessment of formaldehyde, and noted a number of things that had also been identified in previous EPA assessments conducted over the last decade.

Some of the concerns raised include a lack of information regarding study selection criteria, inconsistent methods for evaluating the strengths and weaknesses of studies and the lack of a clear framework for evaluating the weight of evidence for establishing what causes adverse health effects. These are also major limitations with EPA's evaluations of the National Ambient Air Quality Standards, or NAAQS, including the ongoing reconsideration of the ozone standard, which is scheduled to be finalized in July.

A key point of my testimony today is that because of these limitations identified by the NRC committee, the methods used by EPA to assess the risks of air pollution are likely to over-estimate the benefits of more stringent air quality standards. This potentially diverts limited national resources to implementing air quality standards that do not improve public health.

In the evaluation of air pollution studies, including the ongoing ozone science assessment, EPA does not evaluate the strengths and weaknesses of individual studies consistently. In several instances, EPA criticized one study for using a certain methodology while another study using the same methodology did not receive the same

critique. This resulted in the latter study receiving more weight in the overall analysis, when both studies should have been considered equally.

This is consistent with what the NRC committee said about the formaldehyde assessment, and that some studies receive a fuller treatment, including a more extensive assessment of bias and its consequences for estimating effect measures and others receive less attention.

This is a particularly salient issue when studies come to different conclusions. EPA has a tendency to over-emphasize study results that suggest a pollutant may be associated with a health effect and de-emphasize or fail to consider at all study results indicating no association. This leads to a biased assessment of the data. If similar studies show that a certain level of pollution is harmful in some cases but not harmful in others, one must question both results and not just the latter.

Study outcomes depend on many factors besides pollution, so the results of a single study or part of a study are not sufficient to determine what is occurring in the general population. Rather, real effects should be seen in patterns within and across all relevant epidemiology studies and consistent with the results of other types of studies, such as toxicity, mechanistic and exposure studies. This does not necessarily mean that all studies should be in complete agreement, but rather, if a pollutant is truly causing a health effect, it will be evident when all of the data are considered as a whole. EPA does not take this approach in assessing studies.

Overall, and consistent with the NRC formaldehyde committee findings, a presentation of the study selection criteria and a clearly articulated framework for weighing the evidence are critical fro any determination of whether an air pollutant is causing a health effect. The NRC formaldehyde committee recommended that all key studies need to be thoroughly evaluated with standardized approaches that are clearly formulated based on the type of research.

The committee also stated that strengthened, more integrative and more transparent discussions of weight of evidence are needed. The discussions would benefit from more rigorous and systematic coverage of the various determinants of weight of evidence such as consistency. These scientific guidelines should be followed by EPA when evaluating air pollution studies as well. Today, they are not.

Finally, I would like to emphasize that I am not suggesting that air pollutants do not cause harm at high concentrations. Studies have shown consistently that they do. The issue is whether effects occur at air pollution levels observed today. Correcting the weaknesses cited by the NRC committee by using a transparent weight of evidence methodology could significantly improve our understanding of the risks posed by air pollution. This would ensure that we do not use limited national resources to implement air quality standards that do not benefit the health of children or the population at large.

Thank you.

[The prepared statement of Dr. Goodman follows:]

Testimony of Julie E. Goodman, Ph.D., DABT

Regarding Air Quality and Children's Health

Prepared for the
Subcommittee on Clean Air and Nuclear Safety
and the
Subcommittee on Children's Health and Environmental Responsibility
of the
Senate Committee on Environment and Public Works
410 Dirksen Senate Office Building
Washington, DC 20510-6175

Prepared by
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June 8, 2011

Good morning and thank you for the opportunity to testify regarding air quality and children's health. I am Julie E. Goodman, Ph.D., Diplomate of the American Board of Toxicology (DABT). I am a Principal at Gradient, a firm specializing in human health risk assessment in Cambridge, Massachusetts. I also teach a graduate-level epidemiology course at the Harvard School of Public Health. I am presenting testimony this morning on my own behalf as an independent scientist. I am not representing myself under any federal contract or grant.

Clean air and children's health are very important to me, both as a scientist and as a mother. We all want clean air and appropriate standards if they result in health benefits. But unless there is evidence that standards would improve health or reduce the disease burden associated with air pollution, resources should be used towards other measures that would more clearly benefit society.

Several issues with EPA's risk assessment methodologies were noted this year by a committee assembled by the National Research Council (NRC) of the National Academy of Sciences (NRC, 2011). This committee reviewed EPA's draft assessment of formaldehyde (US EPA, 2010b) and noted a number of things that had also been identified in previous EPA assessments conducted over the last decade. Some of the concerns raised include a lack of information regarding study selection criteria, inconsistent methods for evaluating the strengths and weaknesses of studies, and the lack of a clear framework for evaluating the weight of evidence for establishing what causes adverse health effects. These are also major limitations with EPA's evaluations of the National Ambient Air Quality Standards (NAAQS), including the ongoing reconsideration of the ozone standard, which is scheduled to be finalized in July (*e.g.*, US EPA, 2008a and b, 2009, 2010a, 2011).

A key point of my testimony today is that, because of these limitations identified by the NRC committee, the methods used by EPA to assess the risks of air pollution are likely to overestimate the benefits of more stringent air quality standards. This potentially diverts limited national resources to implementing air quality standards that do not improve public health.

In the evaluation of air pollution studies, including the ongoing ozone science assessment, EPA does not evaluate the strengths and weaknesses of individual studies consistently. In several instances, EPA criticized one study for using a certain methodology, while another study – using the same methodology – did not receive the same critique. This resulted in the latter study receiving more weight in the overall analysis, when both studies should have been considered equally. This was consistent with what the NRC committee said about the formaldehyde assessment, in that "[s]ome studies receive a fuller

treatment, including a more extensive assessment of bias and its consequences for estimating effect measures, and others receive less attention."

This is a particularly salient issue when studies come to different conclusions. EPA has a tendency to overemphasize study results that suggest a pollutant may be associated with a health effect and de-emphasize, or fail to consider at all, study results indicating no association. This leads to a biased assessment of the data. If similar studies show that a certain level of pollution is harmful in some cases but not harmful in others, one must question *both* results – not just the latter.

Study outcomes depend on many factors besides pollution, so the results of a single study or part of a study are not sufficient to determine what is occurring in the general population. Rather, real effects should be seen in patterns within and across all relevant epidemiology studies, and consistent with the results of other types of studies, such as toxicity, mechanistic, and exposure studies. This does not necessarily mean that all studies should be in complete agreement; rather, if a pollutant is truly causing a health effect, it will be evident when all of the data are considered as a whole. EPA does not take this approach in assessing studies.

Overall, and consistent with the NRC formaldehyde committee findings, a presentation of the study selection criteria and a clearly articulated framework for weighing the evidence are critical for any determination of whether an air pollutant is causing a health effect. The NRC formaldehyde committee recommended that all key studies "need to be thoroughly evaluated with standardized approaches that are clearly formulated based on the type of research." The committee also stated, "Strengthened, more integrative, and more transparent discussions of weight of evidence are needed. The discussions would benefit from more rigorous and systematic coverage of the various determinants of weight of evidence, such as consistency." These scientific guidelines should be followed by EPA when evaluating air pollution studies as well. Today, they are not.

Finally, I would like to emphasize that I am not suggesting that air pollutants do not cause harm at high concentrations. Studies have shown consistently that they do. The issue is whether effects occur at air pollution levels observed today. Correcting the weaknesses cited by the NRC committee by using a transparent, weight-of-evidence methodology could significantly improve our understanding of the risks posed by air pollution. This would ensure that we do not use limited national resources to implement air quality standards that do not benefit the health of children or the population at large.

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Senator CARPER. Thank you, Dr. Goodman.
Dr. Thorning, please proceed.

STATEMENT OF MARGO THORNING, PH.D., SENIOR VICE PRESIDENT, AMERICAN COUNCIL FOR CAPITAL FORMATION

Ms. THORNING. Thank you, Chairmen Carper and Udall, and members of the Committee. It is a great pleasure to be here with you.

My name is Margo Thorning. I am the Chief Economist for the American Council for Capital Formation. We represent a wide range of American industry, including manufacturing, financial services, as well as individual investors and small firms as well.

In my testimony today I would like to make four points. First, the benefits that EPA alleges stem from the Clean Air Act amendments of 1990. The $2 trillion figure of economic benefits in the year 2020 has no basis in economic reality. That $2 trillion number is based on a survey of individuals asking them what would they be willing to pay for a somewhat reduced risk of mortality. It is also based on surveys of wage differentials between risky occupations like commercial fishermen and office workers.

So that number, the $2 trillion number, has nothing to do with consumption spending, investment spending, government spending. It doesn't create a single job or cause anybody to spend any money. So that number, the $2 trillion number, is not an appropriate one to use to analyze the benefits of the Clean Air Act.

Second point, EPA did its own macroeconomic modeling to look at the costs of the Clean Air Act amendments. I would like to show chart one from my testimony. This is EPA's own data showing that, and the blue case is the cost only case, showing that GDP steadily declines because of the Clean Air amendments. It is down by $79 billion in 2010, by $93 billion compared to the baseline forecast in 2015, and by $110 billion in 2020.

EPA also modeled a case where they assumed that the Clean Air Act increased workers' health, so that we had more workers working and that all the extra people actually found a job. In that case, and that is the red bars in the chart, we still see losses in GDP in 2010 and 2015. We only see a tiny $5 billion increase in GDP in 2020. Compare that $5 billion increase in GDP to the $2 trillion figure that EPA puts on their website as an indication of the economic benefits of the Clean Air Act.

Also, EPA modeled the impact of the Clean Air Act on industrial output. That is figure two in my testimony. It shows significant losses in 2020 of industrial output, particularly in the other minerals category, which is bricks and gypsum and building materials. Particularly losses in aluminum, electricity. Other hard hit industries are petroleum, transportation services. So when EPA does standard macroeconomic modeling, it shows very significant impacts, negative impacts on GDP.

Third point I want to stress is the link between economic growth and reduced mortality. For example, a study by Professor Brenner at Johns Hopkins University found over a 100-year look at the U.S. from 1900 to 2000 a strong correlation between higher per capita income and decreased mortality. That is figure three in my testimony. In addition, a study by Sarah Berghard and her colleagues,

she is at the University of Michigan, showed that higher unemployment levels have a significant negative impact on health.

The fourth point is that investment spending in the U.S. is severely depressed. Compared to the fourth quarter of 2007 when the recession began, we are still down $313 billion, first quarter 2011, we are down $313 billion in investment spending compared to pre-recession levels. That is figure four in my testimony.

The historical data show that each $1 billion increase in investment spending contributes 15,000 new jobs. And conversely, each $1 billion decrease is responsible for a loss of 15,000 jobs. So focusing on the conditions that will let American business feel comfortable to invest, to make productive new investments and hire workers is going to be a key factor for our economic recovery.

So finally, I would say that policymakers need to be very careful as they look at existing and new regulations to be sure the benefits that are reputed to go with those are accurately done, that they really represent real economic benefits, and be very careful as they look at the cost. Because every existing and new regulation, the cost should certainly be less than the benefits.

Finally, I suggest that the best thing we can do for children's health is to be sure their parents can find a productive, good-paying job. Thank you.

[The prepared statement of Ms. Thorning follows:]

The Costs and Benefits of the Clean Air Act Amendments of 1990 on the U.S. Economy

By

Margo Thorning, Ph.D.
Senior Vice President and Chief Economist
American Council for Capital Formation

Before the
Subcommittee on Clean Energy and Nuclear Safety
And
Subcommittee on Children's Health and Environmental Responsibility
Senate Committee on Environment and Public Works
U.S. Senate
June 8, 2011

Executive Summary

EPA's estimate of $2 trillion in CAAA benefits is flawed: The "economic value " calculation is based on (1) surveys that ask individuals what they would be " willing to pay" ("stated" WTP) for a small increase in life expectancy and (2) the wage differential between occupations of different riskiness such as a commercial fishermen compared to an office worker("revealed" WTP). The academic surveys of WTP used by EPA have no link to overall economic activity and do not address how (or if) WTP affects the components of GDP (consumption, investment, government spending and net exports).

EPA's Macroeconomic Model Results Show that CAAA Slows GDP Growth : In sharp contrast to EPA's $2 trillion estimate of the "economic value" of the CAAA described above, EPA's own simulations with its macroeconomic model shows that the CAAA has significant negative impacts on U.S. GDP growth over the 2010- 2020 period (see Figure 1). GDP declines by $79 billion in 2010 and by $110 billion in 2020 relative to the baseline forecast. In other words, the already implemented CAAA regulations have real, quantifiable costs to the economy.

The Link between Economic Growth and Mortality Rate Decline in the U.S.: Many scholars have documented the role between economic growth and declines in the U.S. mortality rate. Professor M. Harvey Brenner of Johns Hopkins University concludes that "Economic growth, cumulatively over at least a decade, has been the central factor in mortality rate decline in the US over the 20th century".

Restoring Strong U.S. Job and GDP Growth: Dramatic reductions in gross private domestic investment since the last quarter of 2007 are by far the largest contributor to the nation's slow GDP growth. In recent years relationship between investment spending and employment has been that each $1 billion dollar decrease in investment is associated with a loss of 15,500 jobs in the U.S. Conversely, each billion dollar increase in investment is associated with 15,500 additional jobs.

The Costs and Benefits of the Clean Air Act Amendments of 1990 on the U.S. Economy

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Subcommittee on Clean Energy and Nuclear Safety
And
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Senate Committee on Environment and Public Works
U.S. Senate
June 8, 2011

Introduction

Chairman Carper, Ranking Member Barrasso, Chairman Udall and Ranking Member Alexander and members of the Subcommittees, my name is Margo Thorning, senior vice president and chief economist, American Council for Capital Formation (ACCF),* Washington, D.C. I am pleased to present this testimony on the costs and benefits Clean Air Act Amendments of 1990 on the U.S. economy.

The American Council for Capital Formation represents a broad cross-section of the American business community, including the manufacturing and financial sectors, Fortune 500 companies and smaller firms, investors, and associations from all sectors of the economy. Our distinguished board of directors includes cabinet members of prior Democratic and Republican administrations, former Members of Congress, prominent business leaders, and public finance and environmental policy experts. The ACCF is celebrating over 30 years of leadership in advocating tax, regulatory, environmental, and trade policies to increase U.S. economic growth and environmental quality.

The Subcommittee Chairmen and Committee members are to be commended for their focus on how the Clean Air Act Amendments of 1990 (CAAA) are impacting health and the U.S. economy. Given the continuing weakness of the U.S. economy, stubbornly high unemployment rate and sluggish investment spending, a careful examination of whether EPA's calculation of $2 trillion in annual benefits of the CAAA is real should be a key issue. Also important is the question of whether the actual economic and health benefits from the CAAA are greater than the costs.

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* *The mission of the American Council for Capital Formation is to promote economic growth through sound tax, environmental, and trade policies. For more information about the Council or for copies of this testimony, please contact the ACCF, 1750 K Street, N.W., Suite 400, Washington, D.C. 20006-2302; telephone: 202.293.5811; fax: 202.785.8165; e-mail: info@accf.org; website: www.accf.org*

Background

The U.S. Environmental Protection Agency's report " The Benefits and Costs of the Clean Air Act from 1990 to 2020" [1] states that the economic value of the Act's air quality improvements will "reach almost $2 trillion for the year , a value which vastly exceeds the cost of efforts to comply with the requirements of the 1990 Clean Air Act Amendments". The EPA report goes on to state that "Even if one were to adopt the extreme assumption that air pollution has no effect on premature mortality –or that avoiding such effects has no value—the benefits of reduced non-fatal health effects and visibility improvements alone are more than twice the total cost of compliance with 1990 Clean Air Act Amendment requirements."[2]

My testimony will examine whether EPA's estimate of $2 trillion in benefits in 2020 is based on sound economic modeling and whether the costs of the CAAA are in fact much smaller than the benefits. The role of economic growth in reducing mortality is also discussed as well as the importance of choosing regulatory polices whose costs are less than their benefits. Given the current slow growth in jobs and GDP in the U.S. , careful attention needs to be paid to the purported benefits and costs of existing and new regulations of all types.

How is EPA 's Estimate of $2 Trillion of CAAA Benefits Calculated?

EPA 's estimate of $2 trillion in benefits from CAAA in 2020 is based on : (1) survey's that ask individuals what they would be " willing to pay" (called "stated" WTP) for a small increase in life expectancy and (2) the wage differential between occupations of different riskiness such as a commercial fishermen compared to an office worker("revealed" WTP). The academic surveys of WTP used by EPA have no link to overall economic activity and do not address how (or if) WTP affects the components of GDP(consumption, investment, government spending and net exports). "Willingness to Pay" responses by survey participants or the wage differential between occupations with different levels of risk do not create any new jobs, cause any investment or increase levels of spending in the U.S. economy.

EPA's Macroeconomic Model Results Show that CAAA Slows GDP Growth

In sharp contrast to EPA's $2 trillion estimate of the "economic value" of the CAAA described above, EPA's own simulations with its macroeconomic model shows that the CAAA has significant negative impacts on U.S. GDP growth over the 2010- 2020 period (see Figure 1). GDP declines by $79 billion in 2010 and by $110 billion in 2020 relative

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[1] The Benefits and Costs of the Clean Air Act from 1990 to 2020, U.S. Environmental Protection Agency, Office of Air and Radiation, Summary Report, March 2011, page 2 ,http://www.epa.gov/cleanairactbenefits/feb11/summaryreport.pdf

[2] Ibid. page 3.

to the baseline forecast. In other words, the already implemented CAAA regulations have real, quantifiable costs to the economy. Even when EPA adjusts the U.S. labor force for estimated health benefits, the economy still shrinks in 2010 and 2015(see Figure 1). By 2020, there is a tiny increase in GDP($5 billion) under the labor force adjusted case. Note that EPA calculation of a $5 billion increase in GDP in 2020 when health benefits are included is only a tiny fraction(0.25 %) of the $2 trillion in claimed " economic benefits" from the CAAA.

In addition to estimating losses in GDP over the 2010-2020 period under the CAAA, EPA's macroeconomic model results also show losses in output by industry(See Figure 2). Losses in industrial output in 2020 range from over 5% in the category "other minerals", almost 4% in aluminum and electricity. Mining, other primary metals, petroleum and transportation services also face significant reductions, compared to the baseline forecast.

The Link between Economic Growth and Mortality Rate Decline in the U.S.

Many scholars have documented the link between economic growth and declines in the U.S. mortality rate. For example, M. Harvey Brenner, Professor of Health Policy and Management, Johns Hopkins University analyzed the relationship between real per capita GDP and the decline in the mortality rate in the U.S. over the 1901-2000 period.[3] Professor Brenner concluded that "Economic growth, cumulatively over at least a decade, has been the central factor in mortality rate decline in the US over the 20th century(see Figure 3)."[4] He explains the "fundamental contributions of economic growth to the reduction of poverty—through the elevation of real incomes via basic earnings and government and employer contributions to the 'social safety net'. For a broader view, it is important to keep in mind investment in the sciences and industrial technologies that directly minimize harm to health, including improved ergonomics, injury control, and reduction of toxic emissions. Of enormous importance is the considerable investment in new medicines, types of surgery and prosthetics, structure of care and hospital facilities and ambulance services." [5]

The role of unemployment is also an important factor in the health of U.S. workers. Professors Burgard, Brand and House have documented the negative relationship between job insecurity and worker health in a recent article in Social Science and Medicine. They conclude that persistent job insecurity is a significant predictor of subsequent health.[6]

Restoring U.S. Job and Economic Growth

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[3] M. Harvey Brenner, Commentary: Economic growth is the basis of mortality rate decline in the 20th century-experience of the United States 1901-2000, International Journal of Epidemiology , July, 2005, http://ije.oxfordjournals.org/content/34/6/1214.full.pdf

[4] Ibid. page 1214.

[5] Ibid. page 1216.

[6] Sarah A. Burgard, Jennie E.Brand, James S. House, Perceived job insecurity and worker health in the United States, Social Science and Medicine, September, 2009, pages 777-785.

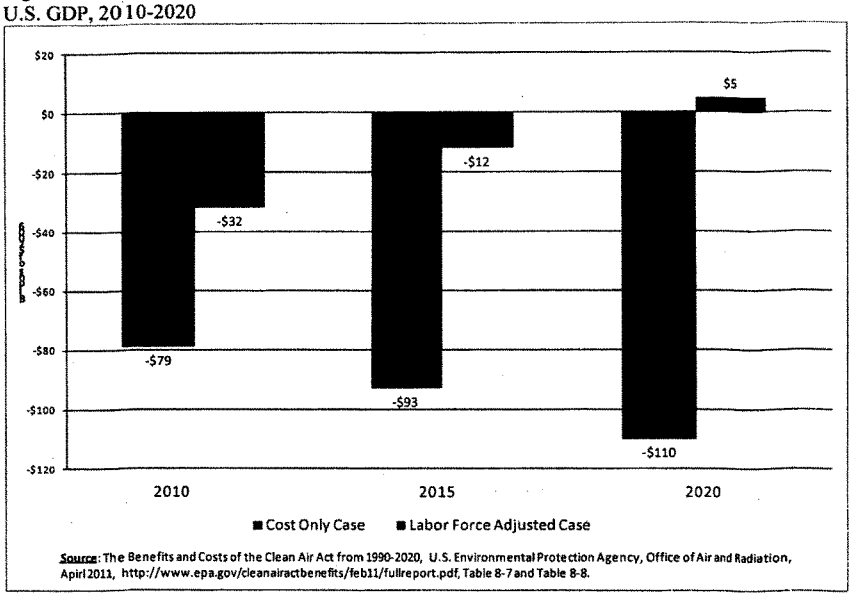
The continuing weakness of U.S. economic growth(1.8 % in the first quarter of 2011) and high unemployment rate(9.1% in May) is of concern to policymakers and workers alike. Although business confidence has improved in the last several months, the business community faces uncertainty on an unusually large number of fronts. For example, the implementation of health care and financial reforms legislation, the specter of an $18 trillion dollar federal debt in 2021 as well as the unknown cost of complying with various EPA regulations.

As illustrated in Figure 4 dramatic reductions in gross private domestic investment since the last quarter of 2007 are by far the largest contributor to the nation's slow GDP growth. Gross private domestic investment was down by $313 billion in the first quarter of 2011 relative to the fourth quarter of 2007. In recent years relationship between investment spending and employment has been that each $1 billion dollar decrease in investment is associated with a loss of 15,500 jobs in the U.S. Conversely, each billion dollar increase in investment is associated with 15,500 additional jobs.

Conclusions

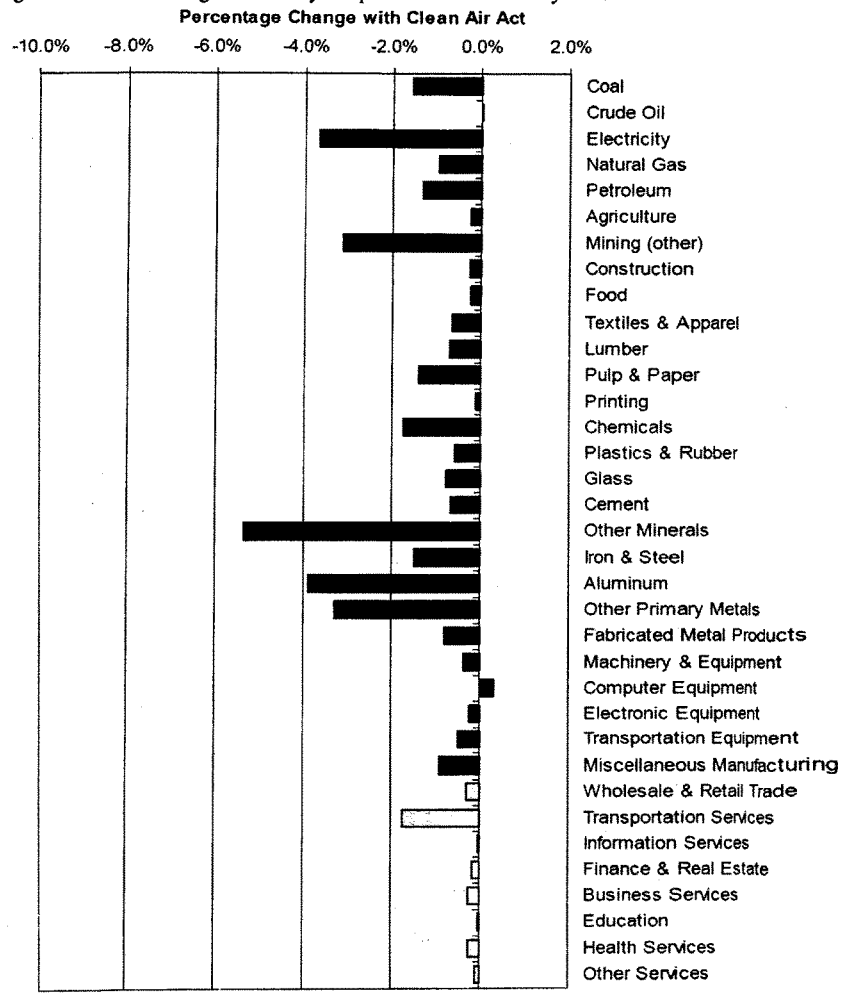
Restoring strong growth to the U.S. economy will require that policymakers fully understand the data being provided by regulatory agencies so as not to impose undue costs that restrain investment spending and job growth. Current and proposed regulations should be analyzed with using sound economic principles and widely respected economic models. EPA's estimated $2 trillion in "economic value" from the CAAA clearly does not meet those criteria. In addition, EPA's own economic modeling shows that the CAAA results in lost GDP and reductions in industrial output over the next decade.

Figure 1. EPA's Estimate of Economic Impact of Clean Air Act Amendments of 1990 on U.S. GDP, 2010-2020



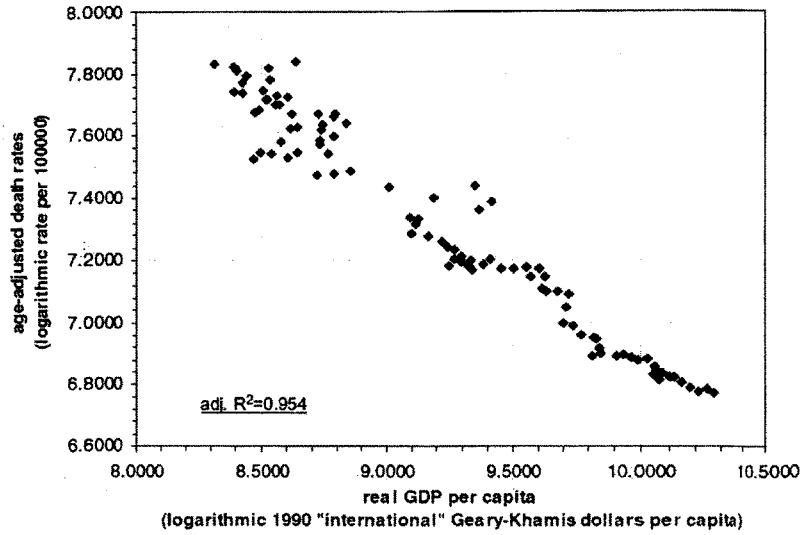
Source: The Benefits and Costs of the Clean Air Act from 1990-2020, U.S. Environmental Protection Agency, Office of Air and Radiation, Apirl 2011, http://www.epa.gov/cleanairactbenefits/feb11/fullreport.pdf, Table 8-7 and Table 8-8.

Figure 2. Percent Change in Industry Output in 2020: Cost-Only Case



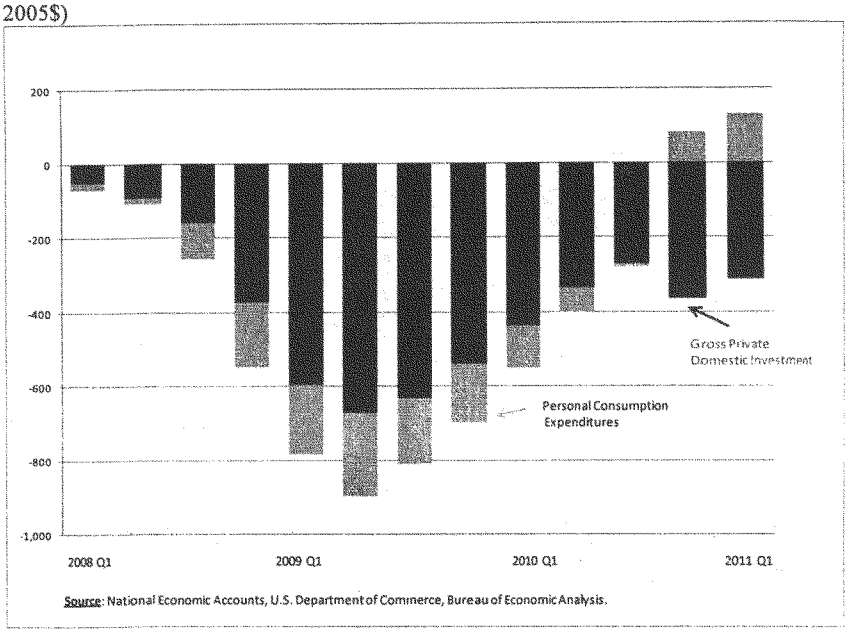
Source: The Benefits and Costs of the Clean Air Act from 1990-2020, U.S. Environmental Protection Agency, Office of Air and Radiation, April 2011, http://www.epa.gov/cleanairactbenefits/feb11/fullreport.pdf, Figure 8-5.

Figure 3. Relation of real GDP per capita to age-adjusted death rates, US 1900–2000 (natural logarithms)



Source: Commentary: Economic growth is the basis of mortality rate decline in the 20th century experience of the United States 1901–2000, M Harvey Brenner, International Journal of Epidemiology 2005; 34:1214–1221, http://ije.oxfordjournals.org/content/34/6/1214.full.pdf

Figure 4. Key Quarterly GDP Components Compared to 2007 4th Quarter (Billions of 2005$)



Source: National Economic Accounts, U.S. Department of Commerce, Bureau of Economic Analysis.

Senator CARPER. Thanks very much.
Ms. Resnik, you are recognized. Please proceed.

STATEMENT OF PATTY RESNIK, RRT-NPS, MBA, FACHE, CPHQ, CPUR, CORPORATE DIRECTOR, PERFORMANCE IMPROVEMENT/UTILIZATION MANAGEMENT, CHRISTIANA CARE HEALTH SYSTEM

Ms. RESNIK. Thank you. I would like to thank Chairman Carper and Chairman Udall and Committee members here for the opportunity to speak today and for your work here.

I am Patty Resnik, I am the Corporate Director of Performance Improvement and Utilization Management at Christiana Care Health System in Delaware. We are the largest health system in Delaware. And today I am representing not only the tens of thousands who suffer from chronic lung disease in Delaware, but also the over 890,000 people of our State who desire to breathe clean air and so protect their good health.

I am a registered respiratory therapist with a sub-specialty certification in neonatal pediatric respiratory care and my professional background also includes education, training and certification in health care quality and utilization management. There are over 150,000 practicing respiratory therapists in the United States. Therapists work under the direction of physicians and they evaluate, treat and care for patients with cardiopulmonary disease, such as asthma.

Asthma is a chronic disease of the respiratory system. Asthma causes swelling and narrowing of the airways, making it difficult for a person to breathe. An asthma attack occurs when a person encounters or is exposed to a trigger. Triggers are different for each individual, but air pollution is a trigger for many people, especially children. Because children's airways are smaller than adults, an asthma attack can be more severe for a child.

When you consider some of the asthma statistics, asthma affects 8.5 percent of the children in the United States. It is the most common chronic disease in children. It accounts for missed school days, children with asthma miss approximately 2.48 more school days, accounting for the most common cause of absenteeism.

Economic costs are estimated to range between $12.7 billion and $19.7 billion with approximately $2 billion to $2.3 billion directly attributed to children's asthma direct medical costs and the indirect costs of lost productivity from parental work lost time. In Delaware specifically, in 2008, asthma was one of the top three diagnosis for hospitalization for ages 1 to 17.

At our health system, Fiscal Year 2009, a little over 1,900 emergency room visits for asthma, age 18 and younger, making up 22 percent of these visits. At that same time period, about 398 hospital admissions with an average length of stay of 3.7 days. And what that means is that a child in the hospital for 3.7 days is missing approximately 4 days of school, and typically a parent will stay with their child while they are hospitalized, so that parent, if working, misses 4 days of work.

In Fiscal Year 2010, we saw 11 percent increase in admissions to 441 with an average length of stay of 3.78, and a 5 percent increase in our ED visits as well in that time period. We have taken

emergency response to asthma to the highest level, including the availability of having anesthesia in the emergency room to treat people who are resistant to standard care.

In the American Lung Association State of the Air report, every county in Delaware received failing grades for ozone, including Newcastle County, the most populated county, as part of the Philadelphia metro area, is among the to 25 most polluted cities for ozone.

As a full-time working mom with two children, I am concerned about the quality of air. I had the opportunity to serve two terms as our PTA president of my son's elementary school. Early in the first part of my first term, late spring, hot ozone days, the air conditioning malfunctioned. I was inundated with emails and phone calls from parents concerned over the impact of air quality on their children, parents of asthmatics concerned about availability of their child getting from their classroom to the school nurse to get their medications, concerns from parents about early dismissals and having to make alternate child care arrangements, so that someone could be home to meet their children, myself included. This does not account for the lost educational time these children experience due to the repeated early dismissals.

Fortunately, our PTA was able to collaboratively work with our local Government and our local school board to fix that situation, taking over a year to do so.

The Clean Air Act is a vital public health law. It sets health-based air quality standards. The EPA and States around our Country have worked to implement this vital law that reduces air pollution, and it is working.

I entrust this Committee to protect all those at risk from air pollution, those who are most vulnerable, such as our children, to our health enthusiasts. Thank you very much.

[The prepared statement of Ms. Resnik follows:]

Statement of
Patty Resnik, RRT-NPS, MBA, FACHE, CPHQ, CPUR
Corporate Director, Performance Improvement/Utilization Management
Christiana Care Health System

Before the
Senate Committee on Environment and Public Works
Subcommittee on Clean Air and Nuclear Safety and Subcommittee on Children's Healthy and Environmental Responsibility
"Air Quality and Children's Health" Hearing

Washington, D.C.

June 8, 2011

Good morning, I would like to thank Chairman Carper, Chairman Udall, Ranking Member Barrasso, and Ranking Member Alexander and Committee Members for your work here today. I am Patty Resnik, RRT-NPS, MBA, FACHE, CPHQ, CPUR, Corporate Director of Performance Improvement/Utilization Management at Christiana Care Health System in Delaware. Today, I am representing not only the tens of thousands who suffer from chronic lung disease in Delaware, but also the over 890,000 people of our state who desire to breathe clean air and so protect their good health.

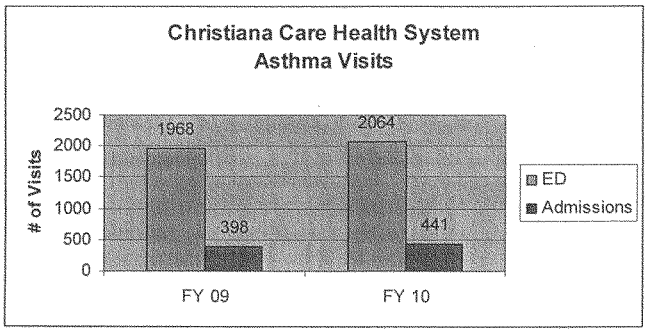
I am a Registered Respiratory Therapist with a sub-specialty certification in Neonatal and Pediatric Respiratory Care. My professional background also includes education, training, and certification in healthcare quality and utilization management. There are over 150,000 practicing Respiratory Therapists (aka Respiratory Care Practitioner or RCP) in the U.S. RCP's work under the direction of a physician and they evaluate, treat, and care for patients with cardiopulmonary disorders such as asthma.

Asthma is a chronic disease of the respiratory system. Asthma causes swelling and narrowing of the airways making it difficult for the person to breathe. An asthma attack occurs when a person encounters a trigger. Air pollution is a trigger for asthma for many people, especially children. Because children's airways are smaller than adult's, an asthma attack can be more severe for a child.

Asthma affects 8.5 percent of children in the U.S. and is the most common chronic disease. Children with asthma miss 2.48 more days of school than their peers making it the most common cause of school absenteeism (Partnership for America's Economic Success). The economic costs of asthma are substantial ranging from an estimated $12.7 to $19.7 billion (Weiss and Sullivan, 2001). This includes both direct medical costs and indirect costs of lost productivity. It is estimated that the annual cost of asthma in children ranges between $2.0 and $3.2 billion. (Wang, Zhong, and Wheeler, 2005; Weiss, Sullivan and Lyttle, 2000)

It is well documented that air pollution affects the health of adults and children. In Delaware, asthma was one of the top three diagnoses for the most frequent reasons for hospitalization for those aged 1-17 year in 2008 (Delaware Hospital Discharge Report, 2008). As an employee of the largest healthcare system in Delaware, I am reminded of this every day. We see people enter into our hospitals who are adversely affected by what they breathe. They are the real stories of suffering.

At Christiana Care, during FY 09 there were 1968 emergency department (ED) visits for asthma. Patients aged 18 or younger represent approximately 22% of the total asthma ED visits during this time period. In addition, there were 398 hospital admissions for asthma for this same time frame. The average length of stay (LOS) for these patients was 3.70 days. This means that school-aged patients missed approximately 4 days of school for their admission to the hospital for asthma. In FY 10, there was a substantial increase, 11%, in the number of hospital admissions for asthma, to 441. The average LOS was 3.78 days. We also experienced a 5% increase in the number of emergency department visits for asthma, to 2064. Patients aged 18 or younger again accounted for approximately 23% of the total asthma ED visits.



Christiana Care has taken asthma emergency response to the highest level. We offer life-saving treatment for asthma including the availability of Isoflurane, an anesthetic agent, in the emergency department(s) and critical care unit(s) if the patient presenting with a severe asthma attack is resistant to standard treatment. We have offered this advanced treatment to Delawareans since 1998.

What we see in our facilities reflects what the American Lung Association's 2011 State of the Air Report showed: that every county in Delaware received failing grades for ozone. In fact, New Castle County, the most populated county, as part of the Philadelphia Metropolitan Area, is among the top 25 most polluted cities for ozone and both year-round and short-term levels of particles. Until air pollution levels improve as a whole, the public's health will continue to be at risk.

It is imperative that we act now since children are one of the most vulnerable populations affected by poor air quality. A large portion of a child's lungs will grow long after he or she is born. Tiny air sacs, called alveoli, continue to develop after birth. Those sacs are where the life-sustaining transfer of oxygen to the blood takes place. In addition, the body's defenses that help adults fight off infections are still developing in young bodies. There is also the potential for overall health impact due to restricted physical activity. Restricted activity may lead to obesity which is a national health crisis. For instance, on high ozone days the recommendations include

limiting outdoor activities. This forces children to remain indoors and participate in more sedentary activities such as watching TV, playing video games, and lying around.

Despite the obvious physical differences, there are several other differences that may not be as obvious. Children take in more air per unit of body weight then adults. (Hricko A, Preston K, Witt H, Peters J, 2008) For example, if a child is running around outside playing a game, he may take in 20 to 50 per cent more air than an adult would doing the same amount of activity. This could mean the child is breathing in more air pollution too.

Children spend more time outside than adults as well. This often includes times when the air pollution is at its peak. While outside they may not recognize the symptoms that adults feel when exposed to high levels of ozone and particle pollution such as tightness in the chest, coughing, watery eyes, sore throat, and headaches. They tend to keep playing and may unknowingly put themselves at greater risk for an asthma attack.

The burden of poor air quality falls hard on families with limited financial resources. They often suffer disproportionately from the pollutants they breathe because of where they reside. These children often lack access to medical care necessary to treat the symptoms if they are recognized. (American Lung Association, 2010)

As a mother of two children- a son and a daughter, I am concerned about the quality of air that my children breathe. I have had the opportunity to recently serve two terms as the PTA President at my child's elementary school. Within my first term a spell of ozone action days occurred and the air conditioner malfunctioned at my youngest child's school. The temperature inside the building was stifling and the air quality was so poor that children were sent home early from school repeatedly. This happened close to the end of the school year and the air conditioning could not be fixed and the early dismissals continued over the final weeks of school.

Immediately I began getting calls from concerned parents and I was inundated with emails about the poor air quality at the school. Several parents shared with me that their child(ren) suffered from asthma and because of the poor air quality at the school, the child(ren) had to be kept home,

missing full days of school. These parents also expressed concern about the availability of their child's asthma medication at school. Medications were kept with the school nurse. To access their asthma medication, the child would have to walk from the classroom to the school nurse's office. Imagine having to walk through a building, while trying to catch your breath, and breathing in hot, stagnant air. Initially I thought that the malfunctioning air conditioner was a school administration issue, not necessarily an issue for the PTA. But after listening to parents, especially those with children who had asthma, or some other health condition, and considering the purpose of the PTA – to promote the welfare of children - I realized that the members of our PTA would be strong advocates for our children. Not only were children with a variety of chronic illnesses such as asthma, diabetes, heart problems, etc, now at risk because they were breathing in unhealthy air, but parents were stressed and worried.

Parents were forced to scramble for unanticipated child care to prepare for the early dismissals, resulting in additional childcare expenses due to early school closures. I personally had to make sure that someone would be available to meet my son, 8 years old at the time, at the bus so he would not have to walk home alone. For those who had children with medical conditions—including children with asthma, this was even more stressful. Finding caregivers who are comfortable caring for a child with a medical condition is not always easy.

Of equal importance, all of the children were missing out on valuable classroom instruction for an extended period of time. This situation happened at the end of one school year and then continued into the early fall of that same year. So again, after having the summer off, the school year started with early dismissals on hot days due to poor air quality. I am pleased to say that the PTA board and membership advocated to the local school board and local government and were able to work collaboratively with the school system to secure re-allocation of funds to replace the air conditioning a year later. But this situation makes clear the often unrecognized risks of unhealthy air quality.

I am here today because I've seen the improvements in air quality that have made Delaware a healthier place to raise children -- improvements made possible by the Clean Air Act. This vital

public health law sets health-based air quality standards. The EPA and states around our country have worked to implement the vital law that reduces air pollution. And it is working.

According to the EPA, the Clean Air Act Amendments of 1990 saved more than 160,000 lives in 2010. I entrust this Committee to protect all of those at risk from air pollution. Those who are most vulnerable populations, such as children, and people with chronic diseases like asthma, to the health enthusiast.

Thank you.

List of Citations:

Partnership for America's Economic Success:
http://www.partnershipforsuccess.org/uploads/20090708_asthmafinalformatted.pdf

Wang LY, Zhong Y, and Wheeler L. Direct and Indirect Costs of Asthma in School-age Children. Preventing Chronic Disease: Public Health Research, Practice, and Policy. 2005; 2(1).

Weiss KB and Sullivan SD. The health economics of asthma and rhinitis. I. Assessing the economic impact. J Allergy Clin Immunol 2001; 107(1); 3-8.

Delaware Health and Social Services: Delaware Hospital Discharge Summary Report - 2008

American Lung Association, State of the Air Report, 2010:
http://www.stateoftheair.org/2011/health-risks/health-risks-disparities.html

Senator CARPER. Thank you so much. And thanks for the good work that you and your colleagues at Christiana Care do for us every day.

One of the guiding principles in my life is actually provided by, of all people, Albert Einstein. Albert Einstein once said, "In adversity lies opportunity." We have plenty of adversity with respect to our health care challenges in this Country. We spend way more money than any other nation. We spend like 18 percent, something like 16, 18 percent of GDP for health care. Places like Japan, they spend half that. They cover everybody, they get better results. They can't be that smart, we can't be that dumb.

But in that adversity lies opportunity. And the opportunity is, how do we reduce our costs and get better health care results for less money.

I think part of the solution is actually with respect to air quality. One of the issues that Senator Inhofe, Senator Voinovich and others on this Committee have worked on before is diesel emission reduction. For every $1 that we spend for diesel emission reduction, with literally implementing and installing technology developed and made in America, we basically get a benefit, economic and health benefit of about $13. That is what I call taking adversity and turning it into opportunity.

And it is not uncommon, you look in my State and you look in other places where people live where there is a lot of highway traffic, a lot of diesel truck traffic, especially, and to look at the incidence of health impairment, particularly for kids, along those arteries. It is pretty clear that something bad is going on, and we have an obligation, and I think an opportunity, to do something about it.

With that sort of set as a precursor, let me just ask a couple of questions. First, I want to ask Ms. Resnik and Mr. Ginda, can you take maybe a minute or two and talk about what a pediatric respiratory therapist does? What kind of treatments would a child received under your care? Just be fairly brief, if you would.

Mr. GINDA. Yes, thank you, Senator. Children come into the hospital for various reasons. A lot of the care that is provided is as an outpatient now compared to the past, where the would previously be admitted. But infections of the lung, reactive airway disease of the upper airways, such as asthma, primarily. There is a population with cystic fibrosis, a genetic disorder that would be treated by respiratory therapists.

But evaluating the patient in the emergency room that would be a child would involve listening to their lungs and listening to their parent describe the symptoms the child has been having, working with the physician to develop a treatment plan that includes medication administration to try and relieve the acute episode they are going through. And then teaching related to measuring their pulmonary function, so that we can actually record the airflow abnormalities and let them track it over time, teach them in a friendly way, like we use a stop light, a red light, a yellow light and a green light, when their peak flow is in the right range and as it starts to decline.

So if they are having a bad air day, like Rhode Island was declared today a bad air day, southern Connecticut, southern Massa-

chusetts, extending out to Nantucket and Martha's Vineyard, all the way out in the water there. So on a day like today, if they were having difficulty breathing, they could measure their peak flow. It is just like taking their temperature if they felt sick, and get a feel for whether that was abnormal.

Senator CARPER. All right, thanks.

Ms. Resnik, can you just respond briefly?

Ms. RESNIK. And in addition to that, the therapist would be working with the family and the child to ensure that the family and child understand what caused the trigger for their asthma attack, what caused them to come to the hospital, do they have an asthma action plan so that they can self-manage their disease at home and not have to come to the hospital, do they have access to medications, can the family afford those medications, and help develop that plan for transitioning the child back to their home.

Senator CARPER. Can you give us a sense of what kinds of costs are incurred by virtue of these treatments? Just give us an idea.

Mr. GINDA. Yes, Senator. In Rhode Island, 2007 data, the average hospitalization stay in Rhode Island for a child with asthma was 2 days when they were hospitalized. A child under age 5 had the highest hospitalization rate. The average charge for that hospitalization was $7,840.

Senator CARPER. How much?

Mr. GINDA. It was $7,840. Now, in 2007 in Rhode Island there were 1,856 emergency department visits by children with a primary diagnosis of asthma. The average charge for each one of those emergency Department visits was $1,823 per visit. Again, children under age 5 accounted for 46 percent of all the ED visits. And the average charge was $2,013.

In Rhode Island, we see the highest visits by the socio-economically disadvantaged, particularly the Providence County area of Rhode Island. The effect of asthma on blacks is four times that of on Hispanic whites, and the effect on Hispanics is two times that of whites. So they are tremendously different.

Senator CARPER. Wow. That is a lot of money.

Ms. Resnik, did you want to add?

Ms. RESNIK. I did provide in my testimony the statistics for Delaware for Christiana Care. I would be happy to followup in writing with you on the costs of that care.

Senator CARPER. All right.

I am going to stop right there and yield to Senator Barrasso. We will have a second round of questions. Thank you for your responses. Senator Barrasso?

Senator BARRASSO. Thank you very much, Mr. Chairman.

Dr. Thorning, if I could, I was looking through your testimony and there is a table two, a figure two of your testimony entitled percentage change in industry output in 2020, and a cost only case. It shows the sectors of the economy that would be most hit by this new Clean Air Act regulations, it is going to be electricity, mining, minerals, aluminum and coal. Then it goes on to show other sectors, like agriculture, lumber, transportation, equipment, iron, steel, plastics, rubber, petroleum also going to be hard hit.

In your opinion, how vital are these sectors in the economy in terms of manufacturing and developing the American products for future and creating jobs in this Country?

Ms. THORNING. I think they are extremely critical to our economic recovery and to our competitiveness internationally. For example, the other minerals category that is most hard hit includes a range of products used in building, road construction, homebuilding. So to the extent those industries are impacted by these regulations, it is going to be harder to see the kind of restart we need in our economy.

Certainly the energy sector is critical. I don't know if you noticed Richard Fisher of the Dallas Feds discussion yesterday on Squawkbox, high energy prices are one of the key problems right now in terms of economic recovery. And electricity prices, too, we need to focus on cost-effective policies that will help us have cleaner energy and not negatively impact, not raise energy prices for our households and producers.

Senator BARRASSO. That gets to the issue of child mortality, because you cited Professor Brenner of Johns Hopkins University, who stated that economic growth leads to lowering of morality rates.

Ms. THORNING. Yes.

Senator BARRASSO. So does that include lowering the mortality rates for children as well?

Ms. THORNING. Of course, yes.

Senator BARRASSO. Thank you.

A couple other things. Dr. Goodman, you stated that the EPA has a tendency to over-emphasize study results that suggest a pollutant may be associated with a health effect, and then they deemphasize or fail to consider at all different study results when they don't see an association. Do you think the EPA's practice in this regard is scientific or is it something different?

Ms. GOODMAN. I'm sorry, I don't understand.

Senator BARRASSO. You said that the EPA has a tendency to over-emphasize study results that they like, and under-emphasize study results that they don't like.

Ms. GOODMAN. Right.

Senator BARRASSO. Is that actually being fair and honest with the American people?

Ms. GOODMAN. No, I don't think it is an appropriate way to analyze scientific data. The appropriate way to analyze data is to look at it all and give everything, every study equal consideration and strengthen limitations equally among all studies.

Senator BARRASSO. Based on the scientific evidence, as opposed to the ones you like, picking and choosing the ones you like and the ones you don't like?

Ms. GOODMAN. Correct, based on the scientific evidence.

Senator BARRASSO. But if EPA is making policies this way, they could then make decisions that needlessly cost jobs under the guise of trying to say they are protecting the public health or environment?

Ms. GOODMAN. That is possible, yes.

Senator BARRASSO. OK.

Dr. Upson, I understand that the EPA has paid, has paid the American Lung Association, and you are here representing the American Lung Association, as a member of the board, that the EPA has paid the American Lung Association more than $20 million, perhaps double the payments that the EPA made to the American Lung Association in the 1990's, and that the American Lung Association also received another $3.7 million from the American Recovery and Reinvestment Act of 2009, the so-called stimulus package, is that correct?

Dr. UPSON. I don't know, sir.

Senator BARRASSO. Well, it is an article in the Washington Times, Mr. Chairman. I would like to have that Washington Times article from March 31st included in the record.

Senator CARPER. Without objection.

[The referenced material was not submitted at time of print.]

Senator BARRASSO. So the letter says that you, the American Lung Association has been paid millions and millions of money from the taxpayers, from the Environmental Protection Agency, as well as this so-called Stimulus Act. It goes on to say that your organization puts ads, does polls and lobbies Congress specifically for more EPA regulation. Your organization has sued to expand the EPA's authority. And your organization regularly issues reports that lament supposedly poor air quality in the United States and touts the purported benefits of EPA's actions that they have paid you to do and to say.

So just to make clear for the people who are here, does the American Lung Association, of which you serve on the board, does the American Lung Association and/or its affiliates use taxpayer funds to lobby Congress for more EPA regulations?

Dr. UPSON. I am on the local board of New Mexico. I know that in New Mexico, we do not receive any money from EPA.

Senator BARRASSO. Do you think it is appropriate for the American Lung Association to take money from the Government to lobby the Government, to sue as well? Is that one of the goals of the American Lung Association? Is that kind of why you went into this?

Dr. UPSON. The goal of the American Lung Association is to improve lung health for Americans.

Senator BARRASSO. So it sounds good to you, these other things? They sound fair?

Dr. UPSON. The funds that are provided by EPA, as I understand, are for specific programs. And we have somebody from the American Lung Association who could answer that better than I could, or I could get back to you in writing on the separation of those funds. I know there are of course strict regulations on how fund are used, so that there is no conflict of interest.

I think that the EPA and the American Lung Association share the goal of improving lung health and, especially, I don't know about the EPA, but for the Lung Association, certainly especially for children who are the most vulnerable to the effects of air pollution.

Senator BARRASSO. Thank you, Mr. Chairman.

Senator CARPER. If you just make sure you respond for the record, that would be great. Thank you.

Senator Udall.

Senator UDALL. Thank you, Senator Carper. I think Dr. Upson is on the local lung board in New Mexico, and obviously the national association will respond and have an opportunity to put things into the record here.

Dr. Upson, your testimony is pretty clear that abundant and clear peer-reviewed research demonstrates that air pollution harms health. I am quoting there from your testimony. There are a number of helpful examples in your testimony. Could you expand upon this point for the benefit of those watching who may not be able to read all the testimony?

Dr. UPSON. Thank you, Senator Udall. There is an institute called the Health Effects Institute, which is a non-profit organization which is funded half by worldwide motor vehicle industry and half by the EPA. And it reported recently, last year, on a very thorough review of the literature on traffic-related air pollution. They used rigorous guidelines into which studies they could accept or not accept.

They found, many of the studies were not sufficient, they were suggestive, but more research needed to be done. However, the evidence was sufficient to support a causal relationship between exposure to traffic-related air pollution and exacerbation of asthma. And that has been found in literally hundreds of studies. There is a suggestion that air pollution may in fact cause asthma, but we don't have enough strength to say that yet. But we do clearly know that asthma exacerbations are related to air pollution.

There was a study done in Southern California which showed that the risk of children developing asthma was three times that for those living in the six high ozone communities compared to the six lower ozone communities.

Senator UDALL. Dr. Upson, today with temperatures in Washington in the mid-'90's and a code orange air quality alert, we obviously have high air pollution concentrations that may be come unhealthy for sensitive groups like people with asthma. I have received from many of my constituents in Albuquerque, saying, and I want to quote a couple of these, "My son is one of the 47,000 New Mexico children with asthma. He especially needs pollution-free clean air." Another Albuquerque resident, "Please continue making every effort to protect environmental legislation, sincerely, someone with asthma." Another from the northwest part of our State, "My husband is an asthmatic, and support for the current law really affect us. Thank you for your work."

Then finally, one says, and they wanted to post this to you, "Dear Senator Udall, I have lived with the real life effects of air pollution. As a mother, it is difficult to witness your child struggle with asthma and feel like there is nothing that you can do, because there are millions of children around the Country like my child in need of cleaner air. I ask, is pollution from industrial sources like power plants, do they place my children at risk of asthma attacks?"

What is your response to these kinds of questions from mothers across America?

Dr. UPSON. So the question is the contribution of pollution to asthma attacks?

Senator UDALL. Yes.

Dr. UPSON. I think the evidence for that is unequivocal. And I don't think anybody disputes that air pollution causes asthma attacks. I had asthma, I still have asthma, and as a child growing up outside of Buffalo, New York, when the steel plants were in full gear, there were nights when I was maybe eight or 9 years old, and I would lie in bed struggling just to get every breath, and I was afraid to go to sleep, because I thought that I would die if I wasn't using every ounce of energy I had to breathe.

So I know what those mothers are talking about. I see it in children of friends, and certainly of course in adults with COPD, I see the same things.

Senator UDALL. One of the witnesses, Dr. Goodman, used the statement, I am not suggesting that air pollutants do not cause harm at high concentrations. Studies have shown they consistently do. But the point here is that in our communities right now, like this high alert here, and like what is happening in New Mexico with the wildfire pollution that is coming over from Arizona, the levels that we are talking about today make a real impact on lungs and have a definite impact on more vulnerable populations, isn't that correct?

Dr. UPSON. That is correct, sir.

Senator UDALL. Thank you.

Senator CARPER. Thank you, Senator.

Senator WHITEHOUSE.

Senator WHITEHOUSE. Dr. Goodman, the sentence that was just quoted as yours, so let me ask you directly, do air pollutants cause harm at air pollution levels observed today?

Ms. GOODMAN. There is no consistent evidence that at the levels below the current standards that air pollution is causing health effects.

Senator WHITEHOUSE. There is no consistent evidence that air pollution is causing health effects today.

Ms. GOODMAN. At exposure levels below the current standard.

Senator WHITEHOUSE. At exposure levels—but you don't say, that is not what your testimony says. You have said the issue is whether effects occur at air pollution levels observed today. Could you answer that question? Do air pollutants cause harm at air pollution levels observed today?

Ms. GOODMAN. What I am saying is studies that look at levels observed today, which are generally below the standards, do not observe health effects associated with pollution consistently, or clearly.

Senator WHITEHOUSE. So there are not air pollution effects from air pollution levels observed today? That is your testimony?

Ms. GOODMAN. I am saying the evidence to date doesn't clearly show that, yes, that is what I am saying.

Senator WHITEHOUSE. Are you or your firm paid by the American Petroleum Institute?

Ms. GOODMAN. Gradient has many private and public sector clients, and API is one of them.

Senator WHITEHOUSE. So you are? The answer is yes?

Ms. GOODMAN. Yes.

Senator WHITEHOUSE. Dr. Thorning, I am not sure I got the end of your testimony exactly right, and I tried to find the language you

used in your written testimony. I didn't see it. But it sounded like your recommendation for parents of a child suffering from asthma is that the parents get a job. What would you tell the parents of the 25,000 Rhode Island kids who have asthma who have jobs already about what we could be doing to help their kids not have to face these bad air days that keep them indoors, not have to have the emergency room visits that Dr. Ginda has referred to at Kent County Hospital?

Ms. THORNING. Senator, the thought I am trying to get across is that we need to focus on trying to restart the American economy and get job growth going. As the chart that Senator Barrasso showed, poverty has the most significant impact on children's health.

Senator WHITEHOUSE. But what about a child who is not in poverty? Children get asthma who aren't in poverty, children get asthma whose parents work. What do you do for them? They are in the hospital, too. They are part of that 25,000.

Ms. THORNING. I think we need to take care, as we look at these existing regulations and future regulations, to be sure that the benefits equal the costs. It is pretty clear that the benefits EPA has alleged that stem from this Clean Air Act amendments are substantially overstated. We need to balance everything and——

Senator WHITEHOUSE. How do you value the cost of a mom who has to spend 2 days in the hospital as Dr. Ginda suggested is the average length of stay for somebody admitted for asthma? Where is that priced in your calculus?

Ms. THORNING. I just refer to the economic calculations that EPA produced with their macroeconomic sims that shows that overall benefits, even when you factor in stronger health benefits in their case, which is the red bars in my chart, you show negative impacts on GDP. Every decrease in GDP means fewer jobs, lower——

Senator WHITEHOUSE. I get the large point. But how does the mom who is spending 2 days in the hospital worrying about her infant, where does the cost of that factor into your calculation? That is what I don't see.

Ms. THORNING. That is certainly a cost to the individual family. I am a macroeconomist thinking about what is best for the overall economy. And right now, our key problem is slows job growth and a very weak economic recovery. As Senator Barrasso's chart shows, poverty is the most significant negative impact on children's overall health. And to the extent we place regulatory burdens on industry that make it difficult for them to invest and hire, we are not going to see recovery. And that is going to have negative impact on children's health.

Dr. UPSON. Senator Whitehouse, may I add something to that? Senator Whitehouse. Of course.

Dr. UPSON. There is evidence, we know that children in poverty have higher rates of asthma. And there is evidence that the reason for that is that those children are living in areas of higher air pollution, they live closer to busy roads, they live closer to industrial plumes. And it is not the poverty itself, except that poverty is what keeps them living in areas of high air pollution.

Senator WHITEHOUSE. Ms. Resnik, is there any doubt in your mind that there is a correlation between to air pollution and asthma?

Ms. RESNIK. My experience as a respiratory therapist is that there are many different triggers of asthma. And air pollution certainly is one of those triggers.

Senator WHITEHOUSE. At levels observed today?

Ms. RESNIK. I am not familiar with that particular——

Senator WHITEHOUSE. Well, at the levels that you actually see out in the world today, that is causing these asthma reactions?

Ms. RESNIK. Yes, would be a trigger for asthma.

Senator WHITEHOUSE. Thank you.

Senator CARPER. Thanks, Senator Whitehouse.

A question if I could for Dr. Upson and for Ms. Resnik. Senator Alexander is not here today, Senator Alexander from Tennessee. I have introduced legislation, a couple of Congresses, actually, but in the last Congress we introduced legislation that would reduce air toxics, reduce sulfur dioxide and nitrogen oxide emissions to levels that are very similar to what the EPA has proposed. Cost estimates of our legislation for the average household I believe were less than $2 a month. Cost estimate of EPA regulations are expected to be very similar.

Let me just ask both of you, if I could, as mothers and health care professionals, would you be willing to spend $2 a month to keep your kids from suffering from asthma attacks or neurological damage from mercury exposure? Would $2 a month outweigh those costs? What do you think?

Dr. UPSON. I think it would. Of course, I am in a privileged category and I would be willing to spend more than my share of that. In fact, I have. I have put solar panels on my house, which will actually save me money in the long run. I have insulated my house, I ride a bicycle to work. And I am doing what I can to reduce air pollution, and I would certainly spend $2 a month more.

Senator CARPER. Thank you. Ms. Resnik?

Ms. RESNIK. As both a mom and a health care professional, I would absolutely be willing to pay $2 a month for clean air and to protect my children's health.

Senator CARPER. Dr. Goodman, as a toxicologist, could you explain for us if you would what happens to a fetus or a child when exposed to high levels of mercury, please?

Ms. GOODMAN. I am not prepared to talk about mercury today.

Senator CARPER. OK. Would you do that for us on the record? Would you followup for the record? That would be much appreciated.

Ms. GOODMAN. I would be happy to.

Senator CARPER. Anybody else want to take a shot at that? I don't know if anybody else is prepared to.

Dr. UPSON. Mercury is a neurotoxin that settles out in the atmosphere, particularly in water systems. The primary source of mercury in people in the U.S. today is from eating fish which has ingested mercury which has fallen from the sky. It is a neurotoxin that particularly affects children because of their developing brains and nervous systems. And it has been shown to decrease cognitive ability.

Senator CARPER. All right, thank you.

This will be a followup for Dr. Goodman and also for Dr. Upson, if I could. When EPA looks at health risks and air toxics, my understanding is that the agency does not look at the cumulative effect of exposure to many different toxics, but looks at them on a one by one basis. Could a child's exposure to one toxic, perhaps dioxin or formaldehyde, be amplified by exposure to other toxics, such as mercury or arsenic, so that a small amount of exposure to one toxic may not seem that unhealthy, but when mixed together with a number of others could be damaging, maybe even dangerous? Could we be underestimating health risks to our children as a result?

Dr. Goodman, could you respond to that? Then I will ask Dr. Upson too.

Ms. GOODMAN. It is true that there haven't been many studies today where we are looking at these kinds of cumulative exposures. But I do think that science is moving in that direction. But I would say that when we do a lot of these human studies that we are doing observational studies looking at people in the real world, you are trying to isolate the effects of one particular chemical. But people are exposed to everything else that they are exposed to in their everyday lives. So often that could be accounted for.

And another thing to add is that in many of these studies, looking at air pollutants, several air pollutants are measured and are accounted for in the analysis.

Senator CARPER. Dr. Upson, please, same question.

Dr. UPSON. Yes, sir, I think that you are absolutely right, it is very likely that the mix of pollutants is going to be found to create more damage than any one individual. The ones we look at now are surrogates for the whole mix. If we see a lot of those, we might infer there are other pollutants.

There are problems with that because of dispersal and we don't know exactly what those other pollutants are. I think it is an area that we need to invest some funding in for research to find out how much the danger is and which mix is really the worst and what we can do about it.

Senator CARPER. All right. And then just briefly, Dr. Upson, it is my understanding that 2010 was one of the hottest years on record. Throughout the northeast region of our Country it is estimated that we had the most 90 degree plus days in the last 25 years recorded in 2010, while in 2009 we had the fewest number of 90 degree days plus for the same time interval. At the same time, we also had a rise in ozone days in 2010 compared to 2009. I think the northeast region had something like 63 ozone days in 2010 and about 34 in 2009.

Do you believe the warm weather might have had something to do with the difference in ozone days? Do you expect we might see more ozone days to come, as our temperatures continue to rise?

Dr. UPSON. Yes. Ozone is formed from the action of sunlight and heat on nitrogen oxides and reactive hydrocarbons, so that as temperatures rise, there is increased ozone formation.

Senator CARPER. Just a followup with Ms. Resnik and I will close with this. You mentioned that there was an uptick in asthma related to hospital visits in 2010 compared to 2009 at Christiana

Care. I realize there are many factors that are at play, but is it possible that more ozone days could be one of those factors?

Ms. RESNIK. As you noted, Senator, there are many reasons why that we could have seen an increase in those asthma visits. But it is possible that ozone, air pollution could have contributed to that.

Senator CARPER. All right, my time has expired. Senator Barrasso?

Senator BARRASSO. Thank you, Mr. Chair.

Just following up, Ms. Resnik, on the previous question, it is interesting, because the Centers for Disease Control, they reported in their May 2011, just last month in their update on asthma in the United States that "We don't know why asthma rates are rising." Do you agree with that?

Ms. RESNIK. I am not familiar with that. I would like the opportunity to respond in writing.

Senator BARRASSO. Have you done any research in the area as to why asthma rates are rising and if so, can you tell us why they have risen in the United States? Especially why, in my earlier testimony, I talked about how pollution levels have significantly declined in this Country over the last number of decades.

Ms. RESNIK. I have not specifically done any research in that area. That is outside my realm of expertise.

Senator BARRASSO. Thank you.

Dr. Upson, tell me if you agree that doctors are not sure how a person gets asthma.

Dr. UPSON. That is correct. We don't know all the causes. There are probably multiple causes of asthma. Certainly genetics plays a role. It is, there is more and more evidence that environmental exposures play a role. We don't know what causes asthma, that is correct. We do know that asthma exacerbations or asthma attacks are caused by air pollution.

Senator BARRASSO. I think we are pretty clear on the triggers of an asthma attack for somebody who is already asthmatic. The question is, why is that someone may become asthmatic. And you talked about the genetic issue as one.

Dr. UPSON. Yes.

Senator BARRASSO. OK, thank you. Thank you, Mr. Chairman.

Senator CARPER. Senator Udall—Dr. Udall.

Senator UDALL. Dr. Barrasso just asked the question, why asthma rates are rising in the U.S. Dr. Upson, do you have an opinion on that?

Dr. UPSON. I don't know why they are increasing. I think there is certainly evidence, suggestive, not confirmatory yet, that air pollution is related to the development of asthma. As I said, we know that it triggers asthma, and everyone, I think, has been in agreement there. I think it is an area that is ripe for more research. We are trying to find out why, but we don't have the answer.

Senator UDALL. Dr. Ginta, do you have an opinion on that?

Mr. GINTA. Thank you, Senator Udall. Within my written testimony, I have an article that I published last month on diesel and chronic respiratory disease, that would be in your packets. I refer to that on page 17 of the article, that there is a connection they are looking at between some chemical messengers called interleukens, particularly interleuken 8, and then another one

called granulocyte macrophage colony stimulating factor, which are just a couple of genetic possibilities that they are looking at. These inflammatory mediators are stimulated by air pollution, particularly, and they are making that link. So that is the background question that we look at in the clinical setting, this missing piece of environment, are we adequately addressing it when we can continue to see clinical cases of asthma increasing and lack of control in so many patients where we have really good drugs to control it, even when they are accessible.

Senator UDALL. Thank you. Dr. Goodman, the American Lung Association and the American Thoracic Association, the American Society of Pediatrics, all groups of medical doctors and researchers, are telling us that air pollution in American cities today is harmful to public health. Your statement I read earlier continue with the point, the issue is whether effects occur at air pollution levels observed today. That seems to disagree with the medical groups' reading of the evidence.

Are you saying we have no problem with air pollution in American cities today?

Ms. GOODMAN. What I am saying is there have been many, many studies on air pollution and health effects. And if you look at certain studies, you will see that some of them report that certain levels of pollutants are associated with health effects. But then when you look at other studies, you will see that that is not the case. And the issue is, there are many——

Senator UDALL. No, that isn't the question. Let me get you focused on the question here. The question I asked you is, are you saying, are you saying we may have no problem with air pollution in American cities today? I am talking about the air pollution in American cities today. I am not talking about the selective pulling out of information that you are doing from studies. Your statements today seem to suggest that you have no problem with the pollution levels in American cities today.

Ms. GOODMAN. To answer that question, you really have to rely on the scientific evidence. And what——

Senator UDALL. Then the scientific evidence right now is that the standards are exceeded in American cities today. So is there a problem with public health on those standards being exceeded? Most major American cities, like is occurring here in Washington today, the standards are exceeded. Is that a problem for public health?

Ms. GOODMAN. I really don't feel prepared to answer that today. Because really, what I am prepared to talk about is whether there are health effects associated with levels in the studies that have been published below the current standards. And there aren't.

Senator UDALL. Well, the problem that we have today in our American cities is that the standards that the EPA has put into place are being violated. And we are having asthma attacks and we are having all sorts of health consequences as a result of that, as these medical doctors are telling us and medical doctors here on the panel. That is what I wanted you to comment on, but I guess you are not able to comment on that. You would rather comment on picking out studies and arguing with small points with them.

With that, Senator Lautenberg, why don't you go to your questioning? Excuse me, I didn't see Senator Vitter. Senator Vitter, you are in line here. Please.

Senator VITTER. Sure, thank you.

It seems to me we could cut through a lot of this and similar debates if we had confidence in good, sound science that wasn't politicized. So a big part of my goal in a lot of this work has been to demand that we focus on sound science and basing our decisions, legislative and administrative decisions, on that sound science.

I have to tell you right now, I have absolutely no confidence in the science coming out of the EPA. As many of you may be aware, I pushed a National Academy of Sciences report on one issue the EPA was dealing with, formaldehyde, and finally got them to agree to doing that. And the report came out about a month ago, and it documented very clearly that the report and the recommendations EPA had made were not sound, were not based on science, were not credible. And this isn't from some right-wing industry group, this is from the National Academy of Sciences.

I wanted to ask all of you, starting with Dr. Goodman, are you aware of that National Academy of Sciences report and that issue? What do you think it says about the larger issue of getting sound science as a basic for action, including at EPA?

Ms. GOODMAN. I am aware of that report, and I actually discussed it in my testimony today. As I said, I feel that the points brought up in that report were not only relevant for formaldehyde, but for many other EPA assessments, including their assessments of the air pollutants that are addressed by the Clean Air Act.

Senator VITTER. What sort of systemic improvements at EPA do you think it suggests?

Ms. GOODMAN. I think it suggests that EPA needs to have a framework for evaluating the weight of evidence, looking at consistency within and among studies, looking at the strengths and limitations of studies, and not giving more weight to certain studies over others based on their results, but only weighing studies based on the methods that are used.

Senator VITTER. OK. Any others like to comment on that?

Dr. UPSON. The EPA works with CASAC, the Clean air Scientific Advisory Committee, and I had some colleagues who were on that panel, and they used rigorous standards to evaluate their studies. I don't know if that has been true in the past, but I think that is true now. And I think there are other studies, as the one I mentioned on traffic-related air pollution, that uses very rigorous guidelines and comes to similar conclusions as the EPA. I agree that sound science is the basis for all this.

Senator VITTER. I know the case study I am talking about is not Clean Air related, I realize it is a different category. But it does go to the broader issue. Are you aware of this National Academy formaldehyde study and the critique it included about EPA conclusions?

Dr. UPSON. I am not familiar with it.

Senator VITTER. Anyone else like to comment?

Mr. GINTA. Senator, I am not familiar with that National Academy of Sciences thing, but there are other studies from other countries, international studies, six Italian studies, that really are con-

sistent with the conclusions. Mexico City had a really good study where they looked at lung radiology and pulmonary function in children chronically exposed to air pollution. They analyzed chest x-rays of 249 clinically healthy children, 230 from Mexico City, which is a heavily polluted area, chronically exposed to levels that are greater than our national ambient air standards for PM 2.5. They had a control group from the other city nearby that wasn't exposed.

But what they found was striking. They had moderate to severe hyperinflations, which was air trapping, that we see in asthmatics, in 1 child from the control city and 151 out of 230, or 65.6 percent of the polluted city. They had additional linear markings in the lungs consistent with inflammation that was mild to moderate, in 121 of the 230 children, which is 52.6 percent in the air pollution cities. That was in Mexico City.

Italian studies have looked at six Italian cities. They have come up with a similar thing, that air pollution is a trigger for wheezing and gastrointestinal disturbances in children zero to 2 years of age. So I would just offer that there are EPA-related, to my knowledge, but as I evaluate the body of literature out there, they appear to be well-designed, in my opinion. Not being an epidemiologist, coming back.

There is also a meta-analysis that was done in 2010 that looked at, it was really an analysis of the studies. Now, certainly there can be external validity issues if somebody doesn't include the right papers, or excluded papers that didn't say what they wanted them to say. But you go by the quality of the researchers, hopefully, that picked those studies.

They selected 36 studies that were out there. And they were conclusive that short-term effects of PM 2 and NO2 in respiratory health among children and asthma-like symptoms were consistently related.

The last thing I would point out would be related to our national air quality standards as far as ambient air, because that came up before. There is a paper in your packet that I wrote last May, or this past May, there were sub-ambient levels of air pollution associated with asthmatic symptoms in children in the study from Boston University. I can tell you, it was O'Connor and Ness from Boston University School of Medicine. They looked at data from 861 children with persistent asthma in seven urban U.S. communities. What they found, they compared asthma symptom reporting, pulmonary function results and barometric pollution data. They found that higher levels of NO2 and PM 2.5 were associated with asthma-related missed school days and higher concentrations of NO2 with asthma symptoms. It was interesting that almost all the pollutant levels in those studies that they looked at in that multi-city group were below the National Air Ambient Quality Standards, which speaks to the upwind considerations and the fact that air pollution isn't limited to State borders, and it does travel, and weather conditions certainly do affect it, temperature inversions, where it is trapped low to the ground, where all of a sudden one area can suddenly be exposed to a higher concentration than you would normally measure over a cumulative period of time with a reference site.

Senator VITTER. Thank you, Mr. Chairman, if I can just warp up, my main point is the following. I appreciate those studies and that testimony. I am looking at all of your testimony.

In general, though, the problem is, as members of the Senate, Members of Congress, we can't review the literature exhaustively on any given public health issue. We generally should be able to depend on the relevant Federal agency to do that, and make a completely unbiased, completely scientific recommendation based on that purely objective review of the literature.

I can tell you just for me, when it comes to EPA, I have absolutely no faith that that is done in a sound science-based way, none. The episode I have the most personal involvement in is this National Academy of Sciences report, which I pushed for, which unfortunately bore that out.

So I think it is in all of our interest to demand rigorous sound science in Federal agencies, no matter who the Administration is, to give the public, Members of Congress, others, the confidence we need to know that this is science-based and not political agenda-based. Thank you.

Senator UDALL.

[Presiding] Senator Lautenberg.

Senator LAUTENBERG. Thanks, Mr. Chairman. I am sorry, I apologize for not having been here sooner, because this is a discussion that I find critical. And we have your statements, and they are under review by my staff.

But I speak as an expert. I have a grandson who has asthma. And I know what happens when there is a code orange or that the air is polluted. And my daughter, his mother, when he goes to, he is athletic, and when he goes to play in a game or a meet or something like that, the first thing my daughter does is find out where the nearest clinic is, so that if he starts wheezing, she knows she has to get moving.

My sister, who had asthma, and carried a small, I will call it a respirator, that she could plug into the lighter hole in the car, that could help her breathe easier. She was at a school board meeting one night, to which she was elected in New York, and she felt an attack coming on, and started to go for the car and collapsed in the parking lot and never recovered. Asthma.

So we can discuss failures, but we also have to look at the statistics, what does it take? Are more kids getting sick from asthma? Are the attacks more frequent? We have more diseases that challenge child existence. I hear this condemnation of EPA, and know darned well that EPA funding is always a problem. What happens is if you just register disbelief, maybe that helps make the case. But the statistics about families and about children and watching them get sicker, I have a child, a grandchild who also has diabetes. By the way, I have 10 grandchildren, we do have a lot of healthy ones in there. But the other two survive remarkably.

So I want to say that in 1990, both of our parties came together to strengthen the Clean Air Act and protect our children from dangerous air toxics, like mercury, acid, gases. Then the big polluters put their lawyers and lobbyists to work spending millions of dollars to prevent EPA from implementing the law and setting rules to clean up the largest sources of deadly emissions.

That is unacceptable that many rules on air toxics are now more than a decade overdue and children are paying the price, while the industries keep stalling. Just think about what is spewing into the air from power plants and cement plants. First we had mercury, which is brain poison for children. There are dioxins which cause birth defects, lead, which damages nervous systems, reduces children's intelligence levels, arsenic, causes cancer.

After years of delay by the Bush administration, the Obama administration is finally getting the job done, and in a way that treats everyone fairly. The EPA wants to hold all companies to the standards used at the cleanest plants. But big polluters are up to their old tricks and they are claiming that cleaning up their act is going to be too costly.

Ask the parent of a child who is suffering from asthma or other diseases associated with chemicals in the atmosphere, asthma, et cetera. It is nonsense. These company, competitors, have already invested in this technology and they are succeeding.

So we want to be clear. EPA is doing the right thing when it puts limits on the largest sources of mercury and other air toxics. EPA estimates that its rules on cement plants will prevent as many as 2,500 premature deaths and 17,000 asthma outbreaks each year. And we don't want to forget another fact, that children are not simply small adults. That proportionately, children breathe more air than adults, because their bodies are growing, it means they are exposed to more air toxics and smog than adults are. Since a child's lungs, and you may have discussed this, so forgive me if it is repetitions, it says, a child's lungs are still developing; substances that might harm adults can seriously damage a child's health.

So that is why we have a very special responsibility to our children to make sure they always have clean, safe air to breathe. Tragically, this isn't the promise that we are keeping to the next generation. Recent data shows two-thirds of all children in the United States live in areas where the air is fouled by soot, smog, other pollutants that can cause asthma attacks. And nationally now, almost one in ten children suffers from asthma. That is according to new research from the Centers for Disease Control.

New Jersey, one out of 12 of the residents has this lung disease. But the rate is far higher in the area called Newark, Newark's east ward, where one in four residents has asthma. And the east ward is near the region's port, airport and has heavy truck traffic, with drivers idling for hours in residential neighborhoods. Shockingly, improving children's health doesn't appear to be sufficient motivation for some of the other side of the aisle. Earlier this year, the House Republicans tried to stop EPA from making it harder for polluters to foul our air. And we defeated those efforts. But we have to continue remaining vigilant if we want to continue protecting the health of America's children.

So I have introduced legislation to reform TSCA, you all know what TSCA is, the Toxic Substances Control Act, to require all chemicals to be tested and proven safe for their intended use before they get into product, before they make it into other things.

What might be the impact if we could do some reforming for TSCA? What effects could it have on air quality, Ms. Upson?

Dr. UPSON. Senator Lautenberg, your question is the impact of reducing toxic emissions of the health of the people?

Senator LAUTENBERG. Right.

Dr. UPSON. I think there is no question that reducing toxic emissions will improve the health of people, especially people with respiratory conditions, people with asthma, adults with emphysema or bronchitis, cystic fibrosis, any number of respiratory conditions are worsened when people are exposed to air pollution and other toxins.

Senator LAUTENBERG. I am, permit this immodesty, but I am a cancer sponsor of no smoking in airplanes. And it has made a substantial difference. It is hard to imagine what it would be like to get into an airplane today, smoke-filled cabin, who would tolerate it. So when we hear so much about the cost of companies to reduce their emissions, we don't hear enough about the benefits of cleaning up pollution sources and the costs that are saved, in addition to the anguish and pain that is put upon people who are affected by it. How does cleaning up pollution generate tangible economic benefits for the public as a whole? Does it matter?

Dr. UPSON. And your question is, the economic benefit?

Senator LAUTENBERG. Yes, economic benefits.

Dr. UPSON. I think the major economic benefit is in decreased visits to the emergency Department, decreased hospitalizations, fewer days absent from school, fewer days absent from work taking care of children who are home from school. And you mentioned your clean air from tobacco legislation. I have worked a lot on that in New Mexico. And one of the consequences that we saw, a benefit that we weren't anticipating from that legislation, in areas and towns and cities that have gone smoke-free, there have been 17 studies now, all 17 of those studies show a decreased in heart attack or acute myocardial infarction after those laws went into place.

In one town, they reversed that law and the rates of myocardial infarction went back up to the baseline level within 2 weeks.

We weren't anticipating that benefit. This is my opinion, that we would see benefits that we are not even anticipating if we decrease air pollution.

Senator LAUTENBERG. The response that you might get here could be bah humbug.

Thank you very, very much for your testimony.

Senator UDALL. Senator Lautenberg, thank you for that excellent statement. We are now at the close of the hearing, and I want to thank all of the witnesses for their statements. You have given us some very good information and there has been some very compelling testimony.

Senators will have 2 weeks to submit questions and material for the record. I ask that our witnesses promptly respond to these questions. These answers will become part of the hearing record. Again, I appreciate the witnesses' time and attendance. With that, the hearing is adjourned.

[Whereupon, at 11:50 a.m., the committees were adjourned.]

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